CRIDE
RESEARCHERS DOMAIN

CENTRE FOR RESEARCH, INNOVATION, DEVELOPMENT AND ENTREPRENEURSHIP, UK

in Collaboration with

DEPARTMENT OF ECONOMICS, NATIONAL OPEN UNIVERSITY OF NIGERIA, ABUJA AND PHILOMATH UNIVERSITY, ABUJA



BOOK OF PROCEEDINGS

Theme:
SUSTAINABLE DEVELOPMENT:
LEAVING NO ONE BEHIND

Date:
10th - 13th September, 2024

Time:
9am- 5pm Daily

Venue:
Dept. of Economics,
National Open University
of Nigeria, Jabi, Abuja.

FOREWORD

CRIDE United Kingdom organises the biennial Centre for Research Innovation Development and Entrepreneurship (CRIDE) International Conference. By fostering information exchange and establishing an environment for all disciplines, the conference aims to provide a platform for showcasing advancements in diverse areas of sustainable development. This inaugural edition, which is titled the 1st CRIDE International Conference (CIC2024) and has as its theme "*Sustainable Development: Leaving No One Behind*," is meticulously organised to present sustainable development solutions for economic problems.

There were about 80 technical papers submitted, and 54 of them were approved for inclusion in the conference proceedings following rigorous blind peer review procedures. A wide range of contributors from academia, industry, and research have contributed to this conference's richness. A strong foundation of knowledge in all related fields is provided by their logical and technological presentations. Even in its first edition, the conference has drawn interest from authors and attendees worldwide, which is not surprising. The keynote speakers and the lead paper presented here are internationally renowned from academia and industry. The globe could move closer to sustainable development in practice thanks to the abundance of academic contributions and sustainable development implementations at the conference. To learn new things, connect with professionals, and contribute to the ongoing transformation, we should make the most of it.

CRIDE's contributions to entrepreneurship, innovation, and research are well-known. The conference's organising committee is composed of distinguished researchers and scholars from around the world, including the editorial and technical boards from the UK, Malaysia, Nigeria, and other countries. I express my gratitude on behalf of the conference organising committee to everyone who attended. Thank you to all of our hard-working reviewers for taking the time to complete such a comprehensive review. Thank you, and we look forward to seeing you at the 2nd International Conference of CRIDE.

Engr. Dr. Umar Suleiman Dauda
Chairman, Conference Organising Committee

MEMBERS OF CONFERENCE ORGANISING COMMITTEE

1	Engr. Dr. Umar Suleiman Dauda	Chairman
2	Dr. Kayode Ibrahim Adenuga	Member
3	Professor Ganiyat A. Adesina-Uthman	Member
4	Dr. Hauwa O. Sadiq	Member
5	Professor Simiat Olanike Elias	Member
6	Engr. Olabiyi Ibrahim Farri	Member
7	Dr. Tunde A. Bakare-Aremu	Member
8	Mr. Abel Inabo Obaka	Member
9	Dr. Jimoh Olakunle Saka	Member
10	Dr. Emmanuel Ajudua	Secretary

TECHNICAL SUB-COMMITTEE

1	Professor Simiat Olanike Elias	Chairman
2	Mr. Akinuli Olaleye	Member
3	Engr. Dr. O. P. Agboola	Member
4	Dr. Jimoh Olakunle Saka	Member
5	Engr. Dr. Abdulahi A. Badrudeen	Member
6	Dr. Hauwa O. Sadiq	Secretary

WELFARE SUB-COMMITTEE

1	Dr. Hauwa O. Sadiq	Chairman
2	Dr. Safa Elhadi A. Abdalla	Member
3	Dr. Anifat Salami	Member
4	Dr. Oluchi C.P. Agubosi	Member
5	Mr. Adeyinka M. Olure-Bank	Member
6	Mr. Yakubu Adenuga	Member
7	Dr. Karimat I. Aliyu	Member
8	Mrs. Mariam Salako	Secretary

PUBLICITY SUB-COMMITTEE

1	Mr. Abel Inabo Obaka	Chairman
2	Dr. Tunde A. Bakare-Aremu	Member
3	Dr. Michael Olabode Tomori	Member
4	Dr. Ambali, Azeezat Owoola	Member
5	Mr. Paul Ilegbusi	Member
6	Mrs Howida Ahmed	Member
7	Mrs Mutiat Opeyemi Sanusi	Secretary

FINANCE SUB-COMMITTEE

1	Dr. Hauwa O. Sadiq	Chairman
2	Dr. Yemi Owoeye	Member
3	Dr. Tunde A. Bakare-Aremu	Member
4	Mr. Samuel O. Olusanya	Member
5	Dr. Karima I. Aliyu	Member
6	Dr. Aromolaran Opeyemi	Secretary

LOGISTICS SUB-COMMITTEE

1	Dr. Tunde A. Bakare-Aremu	Chairman
2	Dr. Emmanuel Ajudua	Member
3	Dr. Vivian A. Odishika	Member
4	Mr. Samuel O. Olusanya	Member
5	Mr. Dare Akindamini	Member
6	Mr. Bamidele, Olufisayo	Member
7	Mr. Adeyinka M. Olure-Bank	Member

ICT SUB-COMMITTEE

1	Engr. Olabiyi Ibrahim Farri	Chairman
2	Dr. Azza Hashim Abbas	Member
3	Mr. Samuel O. Olusanya	Member
4	Mr. Adeyinka M. Olure-Bank	Member
5	Engr. Ajeigbe Sunkanmi Kazeem	Secretary

WELCOME SPEECH FROM CRIDE PRESIDENT

Distinguished guests, professors, academics, esteemed colleagues, ladies and gentlemen, it is with great pleasure that I welcome you to the 1st CRIDE International Conference 2024 (CIC2024) proudly hosted by the Centre for Research Innovation Development and Entrepreneurship (CRIDE) in collaboration with the Department of Economics, National Open University of Nigeria (NOUN) Abuja, Nigeria, and Philomath University, Abuja. CRIDE is a private, not-for-profit research organisation registered in England and Wales with headquarters in the heart of London.

CRIDE has a mandate to extend research visibility and collaborate with like-minded researchers, professionals, engineers, scientists, and young scholars who are citizens of all the countries of the world and are passionate about using their skills and expertise to find solutions to varying problems affecting their immediate environment, in England, the host country, and all the countries of the world at large.

We are honoured to have you join us from all corners of the globe, bringing with you a wealth of knowledge, experience, and a shared passion for advancing the frontiers of research and innovation.

At CRIDE, we believe that the intersection of research, innovation, and entrepreneurship is the key to unlocking solutions to the world's most pressing challenges. This conference is a testament to that belief, as it brings together brilliant minds from diverse fields to exchange ideas, share breakthroughs, and forge collaborations that will shape the future.

Over the next couple of days, participants will be presenting their latest research in multidisciplinary fields such as science, social science, technology, and innovation. It is believed that from their research, we shall find out how their research has or can be transformed into impactful solutions, how entrepreneurship can drive economic growth, and how innovation can create a more sustainable and equitable world.

This conference is not just an opportunity to present and discuss research; it is a platform for building networks, inspiring creativity, and fostering partnerships that transcend borders. The dialogues and connections we make here will have a lasting impact on our work and on the global community.

While commending all the academics whose works will be presented, I

encourage you to take full advantage of the sessions, workshops, and networking opportunities meticulously curated to enrich your experience. Engage in meaningful discussions, challenge your perspectives, and be open to the possibilities that this gathering offers.

In closing, I would like to extend my heartfelt thanks to our chief host, the Vice Chancellor of the National Open University of Nigeria, Professor Olufemi A. Peters, all the principal officers of the University, all the distinguished invited guests and keynote speakers, the leadership of CRIDE, heads of various research groups at CRIDE, the Head of Department of Economics, the Directorate of ICT NOUN, where I previously worked, the chair and entire CIC 2024 organising committee, all CRIDE members, and NOUN staff who have worked tirelessly to make this conference a reality. Your dedication is truly appreciated.

Once again, welcome to the 1st CRIDE International Conference 2024 (CIC2024). Let us make the most of this opportunity to learn, innovate, and collaborate for a better future. I wish you all a productive and inspiring conference.

Thank you.



Kayode Ibrahim Adenuga **Ph.D. FHEA MBCS MNSE**.
Director/CEO, Centre for Research, Innovation, Development and Entrepreneurship (**CRIDE**)
Kemp House, 160 City Road, London, EC1V 2NX, United Kingdom.
Mobile: +447557580078. Email: cride@cride.org

WELCOME SPEECH FROM THE CONVENER, CIC2024

Professor Ganiyat A. Adesina-Uthman



Good morning
my Indefatigable Vice Chancellor,
Principal Officers here present
Vice Chancellors of Sister Institutions here present
All Deans of Faculties
Dear Professors within and outside the Faculty and University,
All Directors of Units and Study Centre Directors
Embassies here present
Ministries and Commissions
All academic and non academic staff and students of NOUN & other Universities here present
Gentlemen of the Press
Ladies and Gentlemen

"Indeed, in the creation of the heavens and the earth, and the alternation of the night and the day, and the great ships which sail through the sea with that which benefits people, and what Allah has sent down from the heavens of rain, giving life thereby to the earth after it's lifelessness and dispersing therein every kind of moving creature, and his directing of the winds and the clouds controlled between the heaven and earth are signs for a people who reflect." — Qur'an 2:164.

I put forward this quotation from the Most High because it reminds us all of the national order. Ghafur (2023) describe this verse in her work, she said and I quote:

„In a poetic way, it reminds me of a lot of our natural systems. The verse calls on us all to take on the sacred duty of living in a world that is balanced, respecting others' beliefs and perspectives, conserving the environment, living sustainably, and taking care of our mental health."

I feel highly honoured for I'm privileged to be here again; as the Convener and member of the Pacesetter Department and Faculty; to welcome our noble guests, including the Minister of Education, Ag. Executive Secretary, NUC. DGs of federal parastatal, Keynote speakers, Serving and retired Directors, and all participants, especially the International participants from other countries to the 1st Centre for Research, Innovation, Development, and Entrepreneurship (CRIDE) UK International Conference 2024 (CIC2024) with the theme ***"SUSTAINABLE DEVELOPMENT: LEAVING NO ONE BEHIND"***.

On behalf of our collaborators- the Department of Economics, National Open University of Nigeria, and Philomath University, Abuja, we thank all the participants from over 35 institutions in Nigeria and abroad who have contributed 80 abstracts and scholarly articles to the discourse on this great theme. Your contributions to our academic knowledge on sustainable development would be fundamental to shaping the future of Nigeria, African continent, and the world at large. The world in particular is loaded with great opportunities but full of challenges. CRIDE is out to identify these opportunities innovatively with a focus on research and entrepreneurial activities. Currently, CRIDE awarded a scholarship to a Nigerian young boy showcased by BBC Yoruba documentary as a promising *technopreneur* while still at Government Technical College- Qoyyum Ayomide Adewole is now studying Metallurgical Engineering Technology at Yaba College of Technology, Lagos.

I peeped into most of the papers you have contributed to the CIC2024 through the EasyChair link and conference Gmail, and I am convinced beyond reasonable doubt that the conference will chart a new course that can bring about a paradigm shift on how

sustainable development can contribute to national developments in different countries especially developing countries like Nigeria. I believe that the syndicate rooms' discussion at this conference will contribute to more informed perspectives on sustainability that leave no one behind; legally, politically, economically, transnationally, traditionally, financially, and environmentally among others.

In 2022, according to the sustainable development dashboard for Nigeria, little have we achieved as most goals are stagnant. Looking at the Nigerian SDG dashboard (2023), the nation was able to record ***moderately improved*** status on four (4) SDGs, which are SDGs 6: clean water and sanitation, 9: industry, innovation, and infrastructure, 10: reduced inequality, and 14: life below water. While we have **decreasing status** on life on land, we recorded **stagnant status** on the following twelve (12) SDGs: 1: no poverty, 2: zero hunger, 3: good health and well-being, 4: quality education, 5: gender equality, 7: affordable and clean energy, 8: decent work and economic growth, 11: sustainable cities and accommodation, 12: responsible consumption and production, 13: climate actions, 16: peace, justice, and strong institutions, 17: partnership for goals. CIC2024 is contributing its quota to a global partnership to achieve progress in sustainable development, hence the collaboration of CRIDE, UK with the Department of Economics of our great institution, National Open University of Nigeria, and Philomath University, Abuja.

On a final note, I want to thank the Vice-Chancellor (NOUN), the Principal Officers, Deans and Directors of Units and Study Centres, the Chairman, Organizing Committee, Organising Secretary (OS), and all chairs of sub-committees as well as all members of the CIC2024 planning committee, all members of staff of the Faculty of Social Sciences and all staff and students of the National Open University of Nigeria (NOUN) for the supports and commitments you always show to the Pacesetter Faculty and Department to ensure that our epoch-making event is colourfully successful.

How can I thank our collaborators than to say a big thank you for your incredible support. I hope for more successful collaboration in the future. I do hope that our Keynote Speakers' stimulating discourses on the theme will further task all participants to deliberate extensively on innovative and puzzling findings to enrich existing literature on academic studies on sustainable development!
To complete my array of thanks, I must appreciate our Dear Minister of the Federal Republic of Nigeria for education, Prof. Tairu Mamman, the Ag. ES, NUC, and all guests here present without forgetting gentlemen of the press. Wishing you all, fruitful deliberations and a pleasant stay in Nigeria's Federal Capital. Enjoy the hospitality of the CRIDE, Faculty of Social Sciences, Department of Economics, and NOUN. Please do find time to explore FCT, the beautiful Nigerian seat of power.
Thank you, ME DA SE, SHUKRAN JAZILA, DAALU, ADUPE O, NAA GODE. TERIMA KASIH, MERCI BOKU. GOD BLESS YOU ALL.

WELCOME SPEECH FROM THE DEAN, FACULTY OF SOCIAL SCIENCES (NOUN)

Professor Kamal Bello FCFE, MNPSA, FANPA
Professor of Politics & Administration Protocol

It is a golden opportunity for me as the Dean, Faculty of Social Sciences, National Open University of Nigeria, Jabi, Abuja to present this at this golden forum.

The idea of an Open University in Nigeria was first muted by the National Universities Commission (NUC) under the headship of Professor Jubril Aminu as part of the Fourth National Development Plan in Nigeria (1981-1985) which was accepted and included in section 5 paragraph 40, subsection A of the National Policy on Education in 1977. Thus, National Open University of Nigeria (NOUN) was formerly established through a Law signed on 22nd July, 1983 by the Shehu Shagari led civilian government as a spring board for open and distance learning in Nigeria. The Law was gazetted on 27th July, 1983 as the National Open University Act No. 6 of 1983. The University was however suspended by the military government led by Muhammadu Buhari on 25th April, 1984. It was resuscitated on April 12, 2001 by the then President Obasanjo and commenced academic activities in 2003.

The National Open University of Nigeria (NOUN) as we have it today has become a leading ODL institution in Africa and the universe providing functional, flexible, accessible and cost-effective education for all who seek knowledge. NOUN leverages on Information and Communication Technology (ICT) to deliver an education tailored towards the globalised economy with its over a hundred study centres and still counting.

The Faculty of Social Sciences was established from the inception of NOUN in 2003 as School of Arts and Social Sciences but became Faculty of Social Sciences in 2016 through the restructuring from the former school and unit system to faculty and department system by the then Vice-Chancellor, Professor Abdallah Uba Adamu. The faculty has produced many first class graduates in the various programmes in its seven departments; Criminology & Security Studies, Development Studies, Economics, Mass Communication, Peace Studies & Conflict Resolution, Political Science and Tourism. And it has over 50 thousand active students at both undergraduate and graduate levels with the uncommon support of the current Vice-Chancellor, Professor Olufemi Peters.

We are indeed proud of our alumni who have distinguished themselves in their diverse fields going by the report from the labour market.

You are warmly welcome to NOUN, the only National University in Nigeria with its over 500 thousand active student population. You are welcome to the Faculty of Social Sciences, the leading faculty in NOUN in all ramifications. The international standard facilities of the Faculty and by extension those of the University are available and approved for your use. Enjoy your stay till the end of the conference.

WELCOME ADDRESS BY THE VICE CHANCELLOR OF NOUN
Professor Olufemi A. Peters

GIVING THIS WELCOME ADDRESS at this epoch-making conference of academics and thinkers from both inside and outside the nation, that have assembled to discuss the first CIC2024, hosted by t h e Centre for Research, Innovation, Development, and Entrepreneurship in partnership with the Department of Economics, Faculty of Social Sciences of our esteemed University, and Philomath University, Abuja, gives me great pleasure. This year's conference subject is incredibly relevant, one-of-a-kind, and well-timed. The organising secretariat received around 100 abstracts with the theme " Sustainable Development: Leaving No One Behind," which is not surprising.

Nearly 37 institutions both inside and outside of Nigeria's borders provided these papers. Research, open talks, conferences, collaborations, grants, and linkages have always been at the forefront for this Pace Setter Department and its faculty. For this accomplishment, I would like to congratulate the Dean of the Faculty of Social Sciences, the Head of the Department of Economics, and indeed, the CIC2024 Convener and her team.

Global leaders, intellectuals, bureaucrats, businessmen, and women, delegates from foreign missions, high-level industrial executives, academics, embassies, government parastatals, commissions, academics, and students from different communities and universities are all present at this conference. This year's CIC2024 is centered on how sustainable development objectives may be practically applied to the advancement of many global social, economic, political, moral, cultural, and other spheres of society. To create knowledge transfer on the development and economic stability of nations that leaves no one behind in the development process, this conference, through the collaboration of various agencies and universities, aimed to forge not only academic unity but also ideas of change and transformation and application of the results of scientific research in sustainable development issues. Therefore, interdisciplinarity is the central tenet of this conference at the center of multidisciplinary work.

It is becoming more and more obvious that all forms of knowledge transfer, including conferences at higher education institutions and investments in research and development, are expected to produce results that should initiate the process of creating new knowledge and disseminating it to developed and developing nations to enhance capacity across various sectors. As a result, it is anticipated that the conference will produce policies to help nations identify various SDG objectives that will benefit everyone.

An issue has to be solved, which necessitates studies, according to the problem-solving paradigm. This will yield outcomes that will prompt action. My aspiration is that this assembly will ultimately assist us in identifying particular theoretical frameworks, pragmatic models, and policies that will depict the development process and tackle our distinct and unusual circumstances in Africa and other continents. Consequently, these will serve as roadmaps for future collaboration in sustainable development from various angles. In conclusion, I would like to welcome you all to CICOSS'2024 on behalf of the Council, Management, Staff, and all of the students at the National Open University of Nigeria (NOUN). I hope that more bridges will be built among our collaborators, industries and academics, researchers, and students in Africa and other countries so that development leaves no one behind. With that, I proclaim this conference open, and I hope you all have a fruitful discussion.

PROFILE OF PROFESSOR LYDIA AZIATO



Professor Lydia Aziato was appointed as the third Vice Chancellor of UHAS, effective August 2022, thereby adding UHAS to the short list of Ghanaian Universities with female VCs – only the fifth in Ghana.

Education: Prof. Aziato holds a Bachelor's degree in Nursing and Psychology (2001) and a Master of Philosophy (M.Phil.) in Nursing (2005), both from University of Ghana and a Doctor of Philosophy (Ph.D.) in Nursing from University of the Western Cape, South Africa (2013).

Professional Background: Prof. Aziato worked as a bedside nurse at Mamprobi Polyclinic, Accra before she joined University of Ghana, Legon in 2001 after her first degree. She rose through the ranks from Senior Nurse Technician (2001-2006), to Assistant Lecturer (2006-2008), Lecturer (2008-2014), Senior Lecturer (2014-2017), Associate Professor (2017-2020) and Professor (2020). Thus, she has 21 years of experience in academia.

She was Head of Department for Adult Health at University of Ghana School of Nursing and Midwifery from 2016-2018; Acting Dean (2017-2019); and the first substantive Dean (2019 to 2022).

Prof. Aziato founded *Research Mentorship Alliance*, an NGO that gives her the platform to develop the research skills of young scientists in Ghana. Currently, she is the President of Chi Omicron Chapter of Sigma Theta Tau International (STTI), the second largest Nursing organization globally. She is an active member of STTI and has served within this global space in many capacities, such as reviewer for awards, conference abstracts, and moderator of conference presentations.

Boards and Committees: She has extensive corporate governance experience, having served on several boards and committees locally and internationally. She also has experience in mentoring multi-disciplinary doctoral students under the PanAfrican Doctoral Academy (PADA). She has taught at different levels from certificate to doctoral and in different institutions and units such as: Centre for Social Policy Studies; 37 Nursing and Midwifery Training College; Pantang Nursing Training College; Central University; and the Ghana College of Nurses and Midwives (GCNM). She is an experienced curriculum developer and has worked with Ghana Tertiary Education Commission (GTEC) and Nursing and Midwifery Council of Ghana since 2015, in supervising various programmes for accreditation in various Universities and Schools of Nursing and Midwifery.

Awards & Publications: Prof. Aziato has received several awards and recognitions for her professional and academic excellence, including: Centre of Teaching and Learning Scholarship (CENTALS), Doctoral Scholarship for PhD in Nursing 2011-2012, (University of the Western Cape); Unilever Postgraduate Studies Award for MPhil in Nursing 2003-2005

(College of Health Sciences); First Class Award with highest Cumulative Grade Point Average (CGPA) of her class in 2001; Nursing and Midwifery Council (N&MC) distinction award in Medicine/Medical Nursing, Psychiatric Nursing, Obstetric Nursing, Paediatric Nursing and Patient Care Study during the professional national licensure examinations in 1997.

Prof. Lydia Aziato has published over 100 articles in credible international peerreviewed journals, three books, and four book chapters. Her research interests include pain, breast cancer, and women's health. Citations of her research exceed 1,500, making her the leading nurse scholar in Ghana. She is a reviewer for many journals and serves on three editorial boards, and has supervised over 100 undergraduate, graduate, and doctoral students over the years.

PROFILE OF PROFESSOR VINCENT ADO TENEBE

FCM, FNISEB, FASSONT, FCIHCDN, FNIER, FBSN, JP



Born on the 17th of August, 1958 in Kaduna, Nigeria, Prof. Vincent Ado Tenebe obtained his B.Sc Agriculture, 1982 and M.Sc Agronomy, 1988 from Ahmadu Bello University, Zaria, Nigeria. After a one year Pre-Doctoral Research work at Horticulture Research International (HRI) Wellesbourne, Warick, England, he obtained his PhD from Abubakar Tafawa Balewa University Bauchi, Nigeria in 1995.

A public servant with 40 years post-graduation working experience in academics and management of higher education, Prof. Tenebe rose from the rank of Graduate Assistant to Professor (1984 to 2003). While holding various administrative and management positions in tertiary institutions such as the Ahmadu Belllo University, Zaria, the Abubakar Tafawa Balewa University Bauchi, the National Open University of Nigeria, National Teachers' Institute Kaduna, Taraba State University, Jalingo, Taraba State, Nigeria and the National Universities Commission, Abuja, Nigeria.

He held the prestigious position of Vice-Chancellor of the National Open University of Nigeria, the most populated and most wide spread University in Nigeria and West Africa from 2010 to 2016, after which he became the Vice-Chancellor of Taraba State University, Jalingo, Nigeria (2017 to 2022); and currently the UNESCO/COL Professorial Chair in Open and Distance Learning in West Africa. A recipient of many outstanding awards such as the Most Valuable Vice-Chancellor in Nigeria (2011), News Watch CEO of the year (Public Service) (2014), Socrates' Medal, Oxford, UK (2015), Africa's Best Performing Vice-Chancellor, (Africa Development Magazine, Nairobi Kenya, 2015) Papal Medalist-Bene Merenti (2017) among many others.

As gifted teacher and talented Researcher, Prof. Tenebe has supervised and graduated over 25 PhDs, 64 M.Scs and over 200 B.Scs in various aspects of Agriculture, Education and Management Sciences. Similarly, he has to his credit over 220 articles published in referred national and international journals. He has attended and presented papers at over 250 national and international conferences and workshops in over 70 countries in all the continents of the world. He belongs to over 20 professional associations and a Fellow of over 10 Learned Societies (FBSN, FCM, FASSON, FNISEB, FNIER, FCIHCDN, etc). Similarly, the Professor belongs to many social and community association where he held and still holds leadership responsibilities such as Patron, Agricultural Students Association, ATBU Bauchi 1987-1990, Patron JACEES Clubs, ATBU Bauchi 1998-2006, Secretary Bauchi Golf Club, Bauchi 1999-2006, President YMCA, Bauchi 2006-2008, Patron Catholic Men Organisation (CMO) St. Joseph Catholic Cathedral Kaduna Arch Dioceses, Kaduna 2014 to date, Chairman BOT, Biotechnology Society of Nigeria, Chairman BOT, West and Central Africa Wheat Development Network (WECAWheat), among many others.

Prof. Vincent A. Tenebe whose hobbies include farming, sports, photography, music and travelling is happily married to one lovely wife, Mrs. Rabi Ado Tenebe and they are blessed with children and grandchildren.

PROFILE OF DR. UMAR A. OSENI
Lead Paper Presenter



Dr. Umar A. Oseni is the Secretary General of the Organisation of Islamic Cooperation (OIC) Arbitration Centre. Previously, Dr. Umar A. Oseni was the Chief Executive Officer of the International Islamic Liquidity Management Corporation (IILM), a multilateral financial organization. He was also the Executive Director (Legal and Compliance) and Acting Chief Executive Officer of the IILM.

At some point in his career journey, Dr. Umar was an Associate Professor of Law and Regulation of Islamic Finance at the International Islamic University Malaysia (IIUM). Dr. Umar was also a visiting fellow at the Islamic Legal Studies Program of the Harvard Law School, Harvard University. Apart from being a Harvard-certified negotiator and dispute resolution expert, Dr. Umar has consulted for numerous bodies in the areas of law and regulation of Islamic finance. With a good blend of both significant academic and industry wide experience in Islamic finance law and dispute resolution, Dr. Umar has completed strategic consultancy works for some United Nations agencies such as the International Organization for Migration (IOM), COMCEC of the Organisation of Islamic Cooperation (OIC), Islamic Development Bank (IDB) Group and other government and government-linked agencies.

Dr. Umar is a member of both the Nigerian and the Canadian Bar Associations. He is also a member of the Governance and Ethics Board of the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI).

With over 100 publications in Islamic finance law, Islamic legal studies, arbitration, dispute resolution, and related areas, Umar has published widely in refereed journals and books on Islamic finance and law. Umar co-authored the first Textbook on Islamic Finance titled: *Introduction to Islamic Banking and Finance: Principles and Practice* (United Kingdom: Pearson Education Limited, 2013). He is also a co-author of *IFSA 2013: Commentaries on Islamic Banking and Finance*, and *Alternative Dispute Resolution in Islam* (Kuala Lumpur: IIUM Press, 2013). He co-edited *Islamic Finance and Development* (Cambridge, Massachusetts: ILSP, Harvard Law School, 2014) and *Emerging Issues in Islamic Finance Law and Practice in Malaysia*, (United Kingdom: Emerald Publishing, 2019. He is also the lead editor of *Fintech in Islamic Finance: Theory and Practice* (UK: Taylor and Francis, Routledge, 2019), a pioneering authoritative book on the dynamics of financial technology in Islamic finance. His latest co-authored book is titled, *Islamic Contract Law* published by the Oxford University Press, United Kingdom (2024).

Dr. Umar received his LLB (Hons) in Common Law and Sharī‘ah from the University of Ilorin, Nigeria; Master of Comparative Laws (with Distinction) and PhD from the International Islamic University Malaysia (IIUM). He did his postdoctoral fellowship programme at Harvard Law School where he specialized in dispute management in Islamic finance. He also holds a Professional Master of Law degree in Financial Laws from the York University, Ontario, Canada
.

LEAVING NO ONE BEHIND: SUSTAINABLE DEVELOPMENT THROUGH THE LENS OF ISLAMIC FINANCE PRODUCTS AND SERVICES

Umar A. Oseni
Secretary General, Organisation of Islamic Cooperation Arbitration Centre and
Member, Financial Regulation Advisory Council of Experts, Central Bank of Nigeria

Abstract: As of 2024, global Islamic finance assets have soared to nearly US$6 trillion, reflecting the sector's expansive range of products, services, and solutions across different regions. This growth has brought into sharp focus the previously indistinct connection between Islamic finance and sustainable development, underscoring the alignment of ethical financing principles with long-term environmental and social objectives. This study explores sustainable development via the Islamic financial services industry, scrutinizing case studies across diverse legal frameworks to demonstrate that Islamic finance is designed to be inclusive, transcending social and religious boundaries. The study examines various practical case studies, assesses their impacts, and highlights their global significance. For instance, in, 2023, Saudi Arabia issued US$1.2 billion the Saudi Electricity Company Green Sukuk which was used to finance strategic projects relating to energy efficiency targeted at reducing carbon emission. Similarly, since 2017, Nigeria has issued a total of six (6) Sukuk with a cumulative amount exceeding US$1 billion. In the health sector, Malaysia and Indonesia have structured Islamic insurance (Takaful) products for millions of their citizens which have positively impacted the lives of the people. In most of the structures, policyholders regardless of their religion or social status get paid some surpluses at the end of the year. While Malaysia developed a framework for Sukuk issuances to support the Sustainable Development Goals (SDGs) in April 2021, it prioritizes educational projects through the Khazanah SRI Ihsan Sukuk. In the United Kingdom and the United States, economically beneficial mortgages have been introduced based on Islamic finance principles. One of such home financing solutions is based on diminishing partnership structure which has been widely used in those countries to finance many eligible properties. After a thorough analysis of various products, services and solutions provided through these unique faith-based financing alternatives, which are underpinned by sustainable principles and shared prosperity, the study finds that though Islamic finance is a faith-based financial alternative, its products, solutions and services are meant for all regardless of their religious, ethnic or racial leanings. The fundamental principles of Islamic finance and their modern practical applications also emphasize on the need to meet the demands of the present generation while upholding principles of environmental conservation. In addition, the rights and needs of future generations are also taken care of through the principles of *maslahah* (public interest) and *maqāsid al-Sharī'ah* (the higher objectives of Islamic law) through various legal principles such as preservation of wealth and family lineage or future generation.

TABLE OF CONTENTS

Foreword i

Members of Conference Organising Committee ii

Welcome Speech from CRIDE President iii - iv

Welcome Speech from the Convener, CIC2024 v - vi

Welcome Speech from the Dean, Faculty of Social Sciences (NOUN) vii

Welcome Address by the Vice Chancellor of NOUN viii

Profile of Professor Lydia Aziato ix - x

Profile of Professor Vincent Ado Tenebe xi

Profile of Dr. Umar A. Oseni xii

Leaving No One Behind: Sustainable Development Through the Lens of Islamic Finance Products and Services xiii

Table of Contents xiv-xviii

Sustainable Solutions to Farmers-Herders Clashes in Nigeria 1 - 13
Vincent Ado Tenebe

Stock Market – Related Factors and Investor Confidence: Evidence from Nigeria 14 - 23
Kareem Abidemi Arikewuyo

Mechanization Policy Innovation for Inclusive Sustainable Development 24 - 32
Buba Baba Shani, Aliyu Musa & Hannatu Yohanna Michael

Sustainable Development and the Role of Music in Environmental, Social and Economic Sustainability in Nigeria 33 - 40
Julius Oluwayomi Oluwadamilare & OlaOluwa Marvelous Ayokunmi

Religious Values and Ethics as Precursor for Sustainable Development from Islamic Perspective 41 - 45
Isiaka Adewale Lawal & Azeez Jamiu Adebayo

Harnessing Literary Potentials via Children's Literature for a Lasting, Sustainable Development 46 - 50
Olufemi Abiola & Olusogo A. Odekunle

Antimicrobial Activity of *Securidaca longipedunculata* Root Bark Against *Streptococcus pneumoniae* 51 - 61
Safiya Balarabe, Bala Sidi Aliyu, Nafisa Muhammad Abdullahi & Abubakar Aminu

Annexing Soil Resources in Ondo State for Environmental Sustainability Akinloye Kehinde Francis & Iranola Olaniyi Michael	62 - 65
Traditional Uses and Pharmacological Potential of Medicinal Plants of the Asteraceae Family in Nigeria: A Review Attah C., Ibrahim S., Ahmadu J. H., & Terhide T. S.	66 - 74
Economic Impacts of Tourism Industry Activities in Enugu State, Nigeria Amalu Titus Ejiofor & Enesi Chukwuemeka Majebi	75 – 85
Agricultural Practices and Food Insecurity in Enugu State, Nigeria: Case of Cassava Farmers in Ezeagu Local Government Area Amalu Titus Ejiofor	86 - 91
Financial System Development and Economic Growth: Causality Evidence from Nigeria Louis Ejike Onwudinjo	92 - 101
Intra City Public Transport Drivers' Attitude: Implications on the Sustainability of Tourism Industry Growth in Ibadan Metropolis, Oyo State, Nigeria Olukemi Deborah Adedokun Fagbolu, Adekunle Afeez Bashiru & Olubunmi Modupe Ajayi	102 - 112
Latent Contributions of Some Aquatic Plants in Attaining Sustainable Development in Nigeria: Case Study of Owena River Aquaphytes Rafiu Olugbenga Sanni, Ayomiposi Olayinka Akinkuolie & Ganiyat A. Adesina-Uthman	113 - 123
Emerging Technological Innovations and the Rising Trajectory of the Service Sector in Selected African Countries: The Year 2000 to 2023 Tayo Isaiah Adebimpe & Sarah Olanrewaju Anyanwu	124 - 139
Impact of Emerging Technological Innovations on Sustainable Development in Ten Selected West African Countries Bolaji Titilope Ajileye & Sarah Anyanwu	140 - 149
Islamic Entrepreneurship and Sustainable Development: Leveraging Digital Innovation for Halal Business Growth Shukurat Moronke Bello	150 - 159
Impact of Nigeria External Interactions on Economic Sustainability: A Vector Autoregressive Approach Iortyer Aondover Dominic & Esseyin Funke Josphine	160 - 171
Enhancing Sustainable Fisheries through the Study of the Reproductive Aspects of *Gymnarchus niloticus* in the Niger River, Lokoja, Nigeria Sadiq H. O., Afolabi A. O., Agubosi O. C. P., Aliyu K. I., & Ajibade M. O.	172 - 176
Monetary Policy and Manufacturing Sectors' Productivity in Nigeria: Implication for Effective Participation of Domestic Industries in African Continental Free Trade Agreement Onwudinjo Louis Ejike, Agbo Constance Chichebe & Ofodu Lilian Nnenna	177 - 187

Women Entrepreneurs in the Digital Era: Empirical Analysis of Selected Women Entrepreneurs in Kano State Aisha Aminu	188 - 198
Foreign Direct Investments, Institutions and Human Capital: A Triadic Analysis of Sustainable Development in Nigeria Rasak Adetunji Adefabi	199 - 213
Analysis of Factors Influencing Youth Participation in Agricultural Extension Programmes in Lokoja Local Government Area of Kogi State, Nigeria Nda Mundi	214 - 217
Private Sector Participation in The Nigeria Seaports Development and Operations: A Case of Onne Seaport, Rivers State Ahmed Adamu & Adamu Umar	218 - 230
Effects of Globalization on Nigeria Financial Sector; 1990-2022 Agum Charles & Wilson Daniel Anjola	231 - 239
Entrepreneurship, Inclusive Growth and Poverty Reduction in Nigeria Samuel Olumuyiwa Olusanya, Jelili Babatunde Sufian & Eucharia Chibuzo Ume	240 - 248
Women's Contribution to Conflict Resolution and its Impact on Peace-Building and Sustainable Development in Rwanda Anthonia Hafunjoh Okonye & Samuel Olumuyiwa Olusanya	249 - 253
Impact Of Islamic Banking on Economic Growth in Nigeria Imran Musa Adarehi & Faiza Haruna Maitala	254 - 262
Nexus between Exchange Rate Fluctuation and Balance of Payments in Promoting Sustainable Economic Development in Nigeria (1990 – 2022) Ajudua Ifeanyi Emmanuel, Adewale E. Adegoriola, Vivian Anietem Odishika, Zubair A. Zulaihatu & Olusanya Samuel Olumuyiwa	263 - 269
Climate Change and Health: A Public Health Concern Florence Ngozi Uchendu	270 – 281
Nigerian Corporate Law in Motion: Regulating Adoption of AI in Business Operations Roland Akindele & Naomi Boluwatife Ndidiaha	282 - 287
Factors Responsible for Early Pregnancy among Female Teenagers in Esure, Akure South Local Government, Ondo State, Nigeria Paul H. Ilegbusi & Kayode Adenuga	288 - 295
Effects of Sex Education among Private Secondary School Girls in Ilekun Community, Akure South Local Government, Ondo State, Nigeria Paul Hassan Ilegbusi & Michael Olabode Tomori	296 - 304
Knowledge, Attitude and Management of Adverse Events Following Covid-19 Vaccination among Health Workers of Ilejemeje Local Government Area, Ekiti State	305 - 321

Francisca Chinyere Adebayo, Abiodun Gideon Fatokunbo & Rachael Yetunde Ibidunmoye

Cybercrimes, Internet Penetration and Banking Sector Performance: Empirical Evidence From Nigeria 322 - 332
Faruq Umar Quadri

Assessment of Growth Performance of broiler chickens fed diets supplemented with sunflower (*Heliatus annus)* seed oil for Sustainable Poultry Production 333 - 338
Agubosi O.C.P., Sadiq H.O., Aliyu K.I., Lambe J., & Alexander, J.

Islamic Financing and Sustainable Investments: Case Study of Women Entrepreneurs' Patronage of Jaiz and Taj Banks in Nigeria 339 - 347
Sumayya Adam Ahmad & Ganiyat A. Adesina-Uthman

Digital Citizenship and Smart Country Building: A Way to Moral and Behavioral Change 348 - 351
Adiat Amoke Odunmbaku

Functional Counselling and Technical and Vocational Education Training-Sustainable Development Goals (TVET-SDG) Linkage for Sustainable Development 352 - 359
Ibraheem Adedayo Adediran

Emerging Cyber Crimes and Digital Rights Protection: Evaluating Nigeria's Legal And Regulatory Frameworks 360 - 368
Zaynab O. Shittu-Adenuga & Kayode Adenuga

Determinants of Climate-Smart Agriculture Adaptation among Yam Farmers in Southern Taraba State, Nigeria 369 - 373
Maryanne Odufa Egbeadumah & Chukwudalu Stephen Ikenwa

Financial Flows and Social Sustainability Development in Nigeria 374 - 385
Obadeyi J. A., Ariyibi M. E., & Agbatogun T.O.

Work-Family Interface among Dual-Career Couples: A Comparative Study of Nigerian Couples in Academia and Healthcare 386 - 396
Okoliko Emmanuel Ojonugwa

Ransomware detection System using random forest classifier 397 - 401
Badia Bello & Nurudeen M. Ibrahim

File Integrity Monitoring System 402 – 406
Emmanuel Adeleke & Nurudeen M. Ibrahim

Ratings of Deviant Behaviour among In-School Adolescents in Nigeria: Implications for Sustainable Development 407 - 415
Ileola Elizabeth Oladipo

Promoting Sustainable Solutions for Addressing Substance Use Disorder in Nigeria Anthony Onyebuchi Onwudiwe	416 - 425
Impact of Small and Medium Scale Enterprises on Employment and Poverty Reduction in Plateau State, Nigeria Eneji Mathias Agri, Nnamdi Victor Nsor, Wenyen Tunis Mangni & Iliya Enyikah	426 - 444
Improving Midwifery Practices in Nigeria to Address SDG Indicator 3.1: The Moderating Role of Labour Care Guide Aisha Salihu Abdullahi & Halima Ibrahim S. S.	445 - 454
Islamic Financial Culture as Panacea to Poverty Reduction in Nigeria Chukwunonso Francis Onoh & Fortune Nneka Agu	455 - 463
Digital Technology and Mental Well-Being: Finding A Healthy Balance Aderonke Abolusodun & J.T. Oyeleke	464 - 468
Challenges to SDG 8.3: Promoting Decent Work and Economic Growth for Nigeria's Informal Economy Workers - A Focus on Grain Sellers Lawal Gambo Saulawa, Masoud Saidu Garba, Muhammad Bashir Abubakar & Abdullahi Ismail Yakasai	469 - 475
GLOCALISE Tools: Towards ensuring Sustainable Education and Human Capital Development, Climate Action, and Green Economy Adedokun-Shittu N. A., Shittu AJK., Shotayo E. O., Adeshina N., Abdul Raheem A. M. O., Abdulazeez M. A., & Taiwo, M. A.	476 - 480
The Effectiveness of Artificial Intelligence Technology In Improving Reproductive Efficiency Of Farm Animals Yakub O. Adenuga & Kayode I. Adenuga	481 - 487
Digital Technology Adoption and Innovation Performance of Transportation Sector in Nigeria Olushola E. Omoniyi, Silas Ndace, Ruth Fatima Kolo & Comfort Bolaji Adeniyi	488 - 496
Environmental Sustainability and the Cultural Tourism Xenus: Nigeria's Context Agbebaku Henry Usiobaifo & MajebI Enesi Chukwuemeka	497 – 502
Effect of Business Practice on the Performance if Rice Processing Firms In Niger State, Nigeria Silas Ndace, Olushola E, Omoniyi, Ruth Fatima Kolo & [2]Comfort Bolaji Adeniyi	503 - 513

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

SUSTAINABLE SOLUTIONS TO FARMERS-HERDERS CLASHES IN NIGERIA

PROFESSOR VINCENT ADO TENEBE
Faculty of Agricultural Sciences
National Open University of Nigeria, Kaduna, Nigeria

PAPER PRESENTED AT THE

1ST CIC2024 IN COLLABORATION WITH THE DEPARTMENT OF ECONOMICS, NATIONAL OPEN UNIVERSITY OF NIGERIA (NOUN) AND PHILOMATH UNIVERSITY

THEMED: "SUSTAINABLE DEVELOPMENT LEAVING NO ONE BEHIND"

INTRODUCTION

A herdsman is a rearer of animals, a livestock man or simply a keeper of animals. His livelihood depends solely on the health, wellbeing and general growth and development of his animals. There are many herders amongst the various countries and communities in Africa and indeed the country Nigeria. The Fulanis who occupy many countries from West Africa to East Africa are predominantly herdsmen by their culture and tradition. More than 90% of the Fulanis who practice Agriculture either in the traditional, conservative methods or through modern technologies are keepers of animals or herders. Hence the use of the term herdsmen is often synonymous with Funalis in Nigeria. Thus even herdsmen that belong to so many other ethnic groups or tribes in West Africa or the Northern part of Nigeria are often erroneously referred to as Fulani Herdsmen.



Fig. 1: Typical Herdsmen and Cattle in Nigeria

A farmer who is not a herder is a cultivator or producer of crop plants. The farmer tills and manages the land to yield a good crop harvester for his economic requirements.

Many farmers in Africa and indeed Nigeria are yet to adopt the modern technologies of improved agricultural practices. Hence there is the gross adherence to traditional conservative methods of crop production which are very cumbersome, frustrating full of drudgery and very low economic yields.

Farmers and herders in Nigeria for a very long time in history lived in harmony, peace and love as brothers and sisters without conflict. They enjoyed very lovely symbiotic relationships over the years in that farmers always invited herders to feed on their crops residues in their fields/farms after harvest with the expectant organic fertilization and manuring of the fields after grazing. This love affair between farmers and herders lasted for as long as the country's population remained within manageable levels, it lasted as long as the adverse effects of climate and environmental conditions allowed harmonious crop and animal production.

Then all of a sudden, situations CHANGED. This sudden CHANGE is responsible for the Farmer-Herders clashes in Nigeria.

In order to find lasting solutions to these clashes, there is need to understand the root cause of the problems.



Fig. 2: Crop Farmers Cultivating their Fields in Nigeria

CAUSES OF FARMERS-HERDERS CLASHES IN NIGERIA

Low Level of Education or High Level of Illiteracy Amongst the Farmers and Herders in Nigeria

The education level of majority of the farmers and herders is unacceptably very low. It therefore becomes very difficult for both parties to reach reasonable conclusions especially when it is to do with issues that require critical analysis and many other communal matters of dispute.

Long-time Neglect of Farmers and Herders in the Wild by the Federal and State Governments over the Years

This contributed significantly to problems that resulted to farmer-herders clashes all over the country. These group of uninformed people highly influence the beliefs and cultural and religious practices of the communities. It was a grievous mistake for Nigeria to have left these people to live in the wild even after the independence of the country. An educated farmer or herder plans and execute his activities that have to do with his crop farm or animal/livestock farm. Such plans usually ensure that the farming or grazing potentials of the farmer or herder are maximally utilised for the benefit of all stakeholders.

Wrong and Unsustainable Grazing and Land Use Policies

Fundamental mistakes were committed in the early development of Nigeria, by creating cattle routes across the length and breadth of Nigeria instead of creating and developing ranches and ranges for raising cows, sheep and other animals without much stress. Establishing cattle routes all over the country and encouraging nomadism instead of sedentary livestock production was equivalent to condemning both man and animal to a life pain and suffering without any economic advantage. Adhering to this practice over years without any plans of the various governments in the past and the present one, is like adhering to the old stone age ways of living. There is no developed country especially agriculturally, that still practices nomadism and wondering about by both men and animals in search of food and water. Vivid examples exist in Africa in countries like Kenya, Rwanda, Tanzania and South Africa where sedimentary cattle rearing through ranching yield positive productive results in the countries. Other examples include countries in North Africa, America, Australia and Asia.

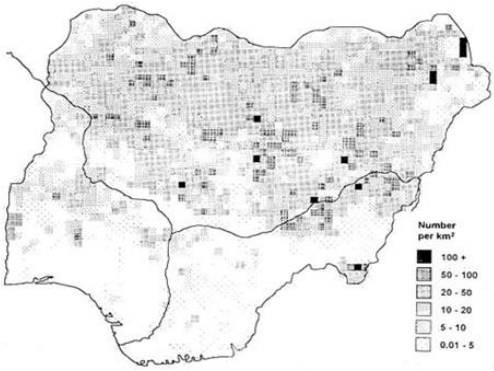


Fig. 3: Map of Nigeria Showing Wet Season Distribution of Cattle

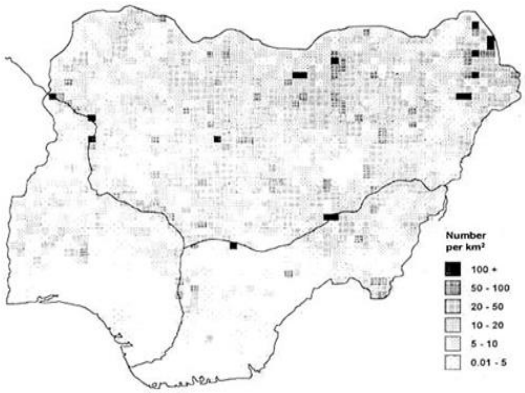


Fig. 4: Map of Nigeria Showing Dry Season Distribution of Cattle

Lack of Appropriate Research and Agricultural Extension Services

The results of the various researches in agriculture in Nigeria never get to the end users – the farmers and the herders. This is because of inadequate trained extension workers. Where the extension workers are available, the lack of funding and provision of working materials grossly limit their efficiencies. Equally important is the lack of adequate funding to carryout research that could positively influence the performance of both farmers and herders.

Population Growth - Both Human and Animal Population

Nigeria is a very fertile and prolific country. The environmental conditions favour the rapid growth of human and animal population. A situation where there is no effective control of population growth, no family planning, no control on the number of legal and illegal union between male and female, there is bound to be population explosion. The rapid growth in populations of both man and livestock in Nigeria like most West African countries exacted great pressure on the land and its ability to produce both feed and water for biological use. This pressure certainly led to struggle between farmers and herders for land and its resource and hence the eventually conflicts, clashes and wars.

Similarly, the non-moderation of the laws of land acquisition that allows farmers to continually acquire land for farming through inheritance has and will continue to cause conflicts between farmers and herders as well as the whole stakeholders in Nigerian agriculture. The inability of Government to regulate and control the conservative shifting cultivation practices of the rural farmers will continue to put extra pressure on the land resources of Nigeria and hence uncontrolled conflicts between farmers and herders. These methods of outdated farming have been changed for better in developed countries many years ago with encouraging positive results. Nigeria cannot be exceptional in this required positive changes in agricultural practices to modern and profitable ones.

Climate Change and Desertification

It is no longer news that the effects of climate change have resulted to drastic changes and modification of the vegetation spread and fresh and table water distribution in Nigeria. These effects have resulted to gradual decline in the amount of vegetation available for animal grazing. This coupled with the rapid desertification resulting from climate change and indiscriminate actions of man on the environment has caused massive migration of farmers and herders from countries north of Nigeria both the Northern part to the Southern region of the country through the middle belt states.

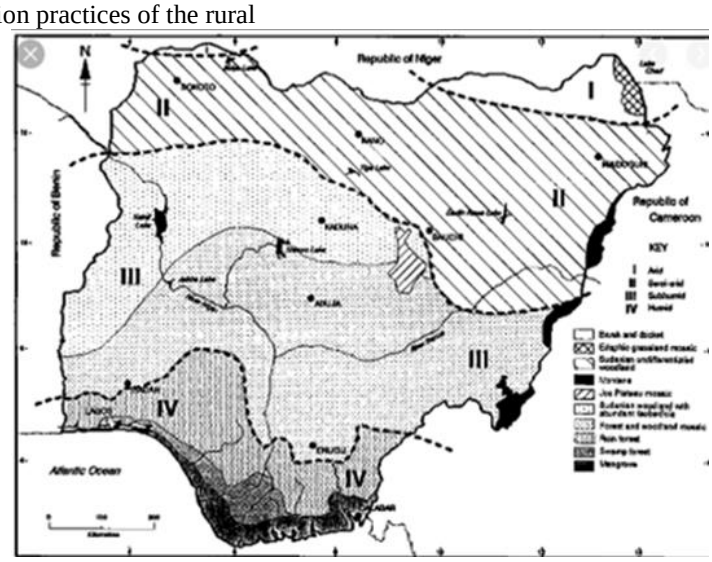


Fig. 5: Map of Nigeria showing Agro-climate Zones

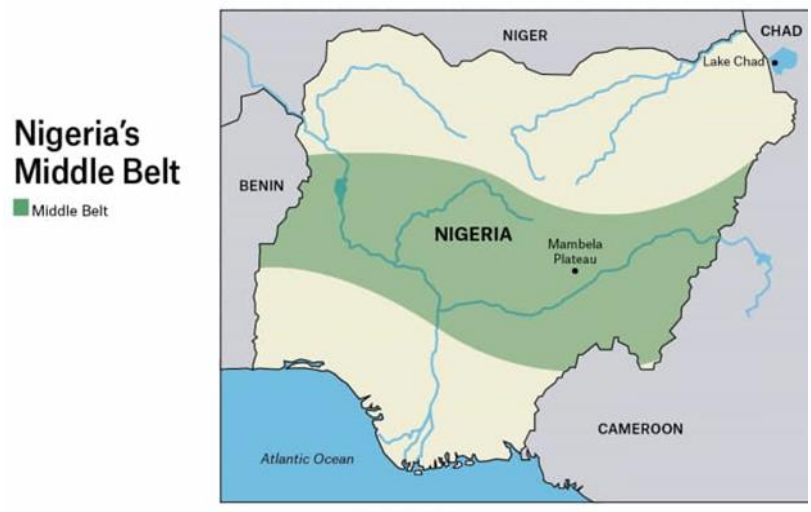


Fig. 6: Map of Nigeria Showing Middle Belt Region

Indiscriminate Farming and Grazing

There is no control in the movement of farmers from one field to another in many parts of Nigeria as long as the land was acquired traditionally through inheritance or purchased from the traditional owners. These indiscriminate random movements from one plot of land to another without control from government expose the land to agents of degradation and eventually low productivity.

Similarly, uncontrolled indiscriminate open and over grazing of fields have very hazardous effects on the land as this equally expose he land to agents of adverse land degradation. When indiscriminate farming and overgrazing occur in a community, there is bound to be conflict and clashes in that community.

Inefficient Land and Environmental Management

There are no well-established organisations or agencies dedicated to land and environmental management in Nigeria. Even if such exist, they are not effective nor efficient. Such agencies would have ensured the replenishment of utilised resources from the land, there by reviving and giving life back to the land. The revitalization of lands will ensure the continuous productivity of the land hence reducing clashes of farmers and herders for land resources.

Use of Low Yielding Local Breeds of Livestock and Local Varieties of Crops

Majority of livestock in Nigeria are the traditional local breed whose productivity is very low. For example, a typical Friesian breed of cow in Israel yields an average of 60litres of milk daily as compared to the 1litre to 2litres of milk from the typical local white Fulani breed of cow in Nigeria. The inability of government t to properly educate herders to accept and adopt high productive breeds of cows in Nigeria has continued to result to very low economic returns to the herders and all stakeholders in the Nigerian Agricultural sector.



Fig. 7a: Improved Friesian Breed of Cattle with low productivity



Fig. 7b: Local Unimproved Breed of cattle with high productivity

Religious and Ethnic/Tribal Sentiments

The role of fanatic religious leaders and preachers which evolved in recent years in Nigeria has a significant contribution to clashes between farmers and herders. Despite the fact that herders in Nigeria are predominantly Muslims while the farmers though mixed Muslims and Christians with majority of Christians being farmers, there was no conflict nor discrimination between them for a very long time in Nigeria. But with the emergences

of overzealous, wealth seeking, popularity and power loving new breeds of preachers from both faiths, a great line of divide with no tolerance nor understanding has erupted in Nigeria. This has led to many religious conflicts in many communities in Nigeria especially in the Northern part in recent years. This religious conflicts always characterises the clashes between farmers and herders often escalating the magnitude.

Negative Use of Social Media, Fake News and Hate Speech

Spreading of false rumours, exaggeration and fake news of events that never occurred contribute significantly to conflicts in Africa and Nigeria not only amongst famers and herders but to many other sectors of the communities. This has led to wanton destruction of lives and properties and unnecessary wars that impeded development and progress in Africa. Then of recent came the use of modern technologies in Information and Communication Technology (ICT) which enabled the use of internet for social media. However, some negatively minded people have decided to explore the negative aspects of this vital method of news dissemination by using it to spread fake news and hate speech. This has often created wide gaps in the unity of the country amongst various communities, religious groups, social and political parties and organisations as well as causing significant disharmony between farmer and herders both within and outside Nigeria. The importance of hate speech in fuelling conflicts in Nigeria has gone to such a high magnitude to the extent that the National Assembly particularly the Senate of the Federal Republic of Nigeria has started discussing the possible capital punishment for such an offence. This has led to other international discussions and commentary on this all important ingredient of conflicts in African countries.

Politics of Bitterness

The role of Politicians in bringing about conflicts and wars in Africa and Nigeria can never be overemphasised. Democracy which is a system of enlightened governance and positive life style for all men has been negatively manipulated by Politicians especially those who are negatively minded, who lack the sportsmanship of fair competitions in elections. Such people always result to wrong use of politics to cause conflicts in the society to their own selfish advantages. Thus those who lose elections instead of cooperating with their counterpart victors to move the society to better developmental levels plot to cause confusion through the use of religion, ethnicity, hate speeches, fake news and all negative vices at their disposal to ensure conflicts in the society.

It is a system of 'if not me, no one else' and hence the destruction of the people. This unfortunate method is utilised in fuelling the farmer-herders clashes in Nigeria resulting to significant loss of lives in the country. In 2014 about 1,425 people died in Nigeria due to conflict (Table 1); in the first half of 2018, more than 1,300 Nigerians died in violence involving farmers and herders.

Table 1: Incidences and Fatalities as at 2014

State	Number of Incidents	Number of Fatalities
Adamawa	5	57
Anambra	1	3
Abuja	1	1
Benue	12	1042
Delta	3	4
Edo	1	1
Enugu	3	51
Imo	1	7
Kaduna	8	118
Kastina	1	8
Kwara	1	5
Nasarawa*	2	20
Ogun	1	3
Ondo	1	1
Plateau	1	22
Taraba	4	21
Zamfara	1	50
TOTAL	**47**	**1425**

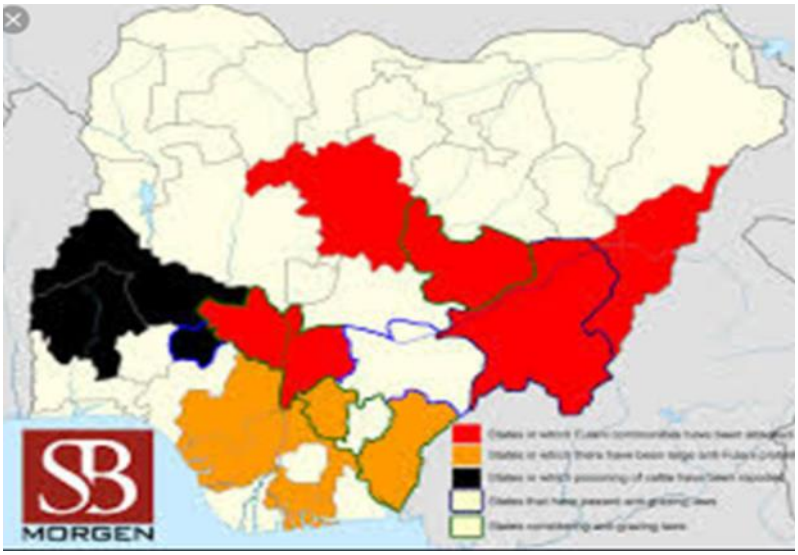


Fig. 8: Map of Nigeria Showing Spread of Farmer-Herders Violence

Insecurity and Illegal Possession of Weapons

The inability of government to properly address the level of insecurity and proliferation of arms in the country is a major contribution to conflicts in Nigeria. The country operates a centrally controlled Federal Security System. All the military and para-military organisations including the Police are all centrally controlled by the Federal Government. This leads to a system whereby State Governors who are constitutionally referred to as the Chief Security Officers of the State, remain grossly ineffective security wise becoming more or less as 'toothless bull dogs' that bark without biting. Orders and live of command for security issues come from Federal Capital, Abuja while the effected communities who are within the States remain unable to obtain relevant solutions to the security problems since decisions come from where the problems are not actually known. This has often resulted to using the wrong methods to solve problems hence leading to more grievous conflicts in the society. This also generate high level of insubordination between Governors who are the Chief Executive Officers of the States and Commanding Officers of Security Units and Police posted to the States with the resultant anarchy and confusion in the communities.



Fig. 9: Picture of a Herdsman with Illegal Military Uniform and Weapons

Illegal Immigrants from Neighbouring Countries

The ineffective control of migrant herders and farmers into Nigeria by the Immigration Service of the country is a major contributory factor to the conflicts in Nigeria. This illegal migration further exerts more pressure on the dwindling land resources for agricultural practices such as farming and livestock production.

Illegal migrants often take possession of land by force from indigenous owners for farming or livestock production thus leading to direct conflicts and communal wars. Such illegal migrants neither respect nor observe the laws, customs and traditions of the host communities. They also often do not have any humanly feelings no mercy when it comes to settling disputes hence the merciless and wanton killings and destruction of life and properties of law abiding Nigerians.

Cattle Rustling, Banditry and Farm Produce Theft

The activities of hooligans, robbers and bandits have further aggravated the clashes between farmers and herders in Nigeria. This often result to blame shifting between farmers and herder. While the herders accuse farmers of cattle rustling and theft of their livestock, the farmers accuse the herders of stealing the farm produce and grazing their animals in their crop fields. Whichever way often results to ugly conflicts and wars between the groups.

This has led to uncountable loss of lives in many states such as Plateau, Kaduna, Zamfara, Adamawa, Taraba, Benue, Nassarawa and Kogi among many others.





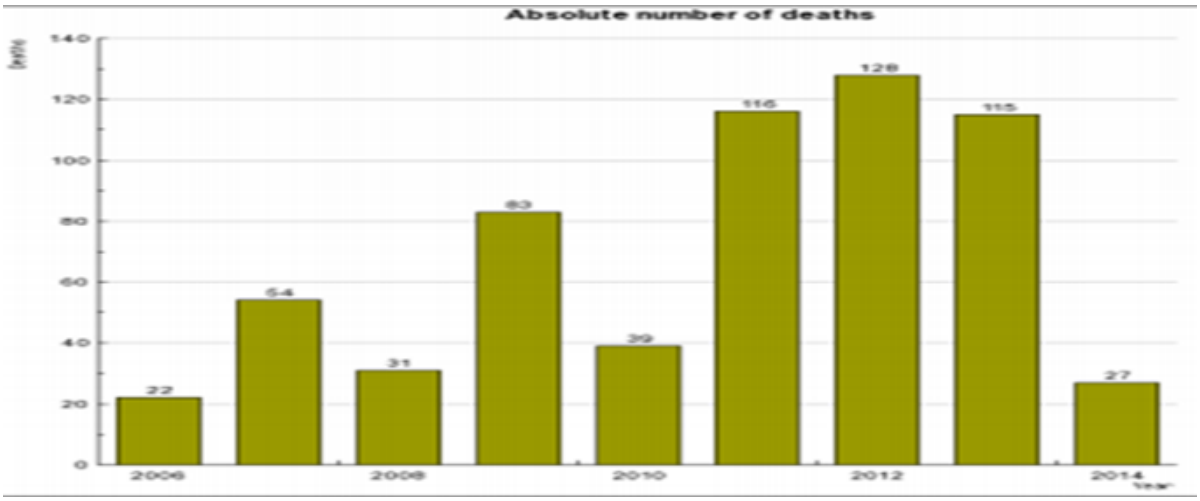


Fig. 11: Death Caused by Farmer-Herder Clashes Yearly

Impunity and Lack of Justice

The inability of the Federal Government to punish offenders or criminals involved in crops and livestock theft and killing of innocent lives in Nigeria is a significant catalyst to conflict in the country. The fragrant display of impunity and none observance and compliance to the rule of law by Government officials and security agents is a major fuelling factor to the criminals. Both farmers and herders in Nigeria have often complained that their demands for justice for past criminal acts and warnings of imminent attacks always received little or no response from Federal authorities. For instance, the Miyetti Allah Cattle Breeders Association (MACBAN), a prominent herders' group, alleged that the government has arrested no one in the murder of their members totalling about 1,000 including women and children, and the slaughter or theft of two million cattle, over the period of 2017 to 2018.



Fig. 12: Destruction of Lives and Properties by Farmers/Herdsmen Clashes and Banditry in Nigeria

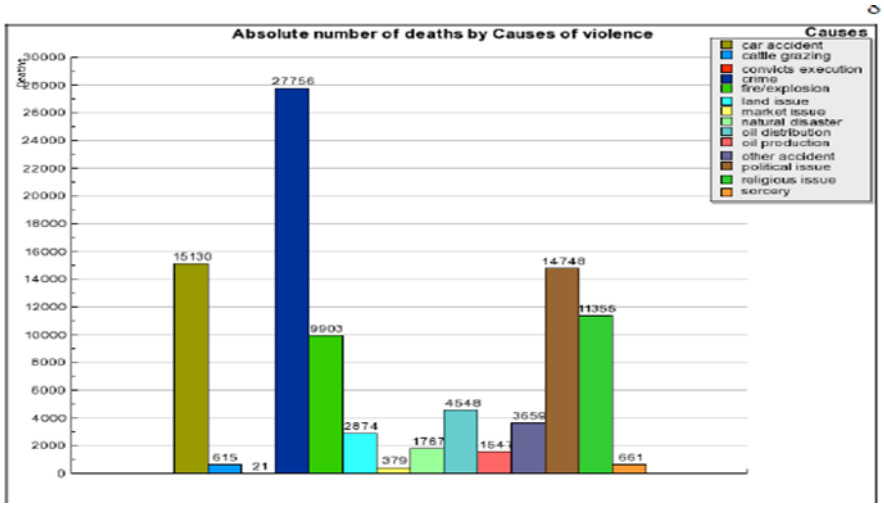


Fig. 13: Causes of Violent Death in Nigeria, cumulated figure (2006-2014)

Similarly, the farmers across the numerous states have complained of none arrest and prosecution of the herdsmen and bandits that attack and burn down villages at night killing innocent lives including women, children and the aged. This gross inaction by Federal Government gives room for criminals to perpetuate their evil acts and terrorism on innocent Nigerians.

SOLUTIONS

In order to find lasting solutions to the problems of conflicts between farmers and herders in Nigeria, there is need for proper understanding of the root causes of the problems. The understanding of such significant causes of the problems is almost 50% attainance of the required solutions. Thus the simplest way to obtaining lasting solutions to the conflicts between farmers and herders in Nigeria is by providing solutions to the identified problems lighted earlier.

Education and Reduction of Illiteracy

According to Nelson Mandela, Education is the greatest means of bringing about change and development in the society. The massive education of the Nigerian populace will bring significant solutions to problems beyond farmers and herders conflict in the country. The education must be from the grassroots, all inclusive, gender sensitive, very effective and meaningful. The education must be all encompassing in order to heal the wounds of illiteracy and wildness in the rural populations of the country. The attempt of the Federal Government through establishment of the Nomadic Education System, the Almajiri Schools in the past though commendable may not enough to address the long accumulation of high illiterate population. More efforts should be made to engage the use of Open and Distance Education (ODE) system in order to reach the unreached. In a fast growing and uncontrolled population like that of Nigeria, ODE remains one of the most effective methods

to educate large population within reasonable time frame.

It was reported at the biannual conference of the 9 most illiterate countries of the World in India in 2013 that China, the most populated country in the world and a prominent member of the group, was able to educate 500 million people in a period of 15 years through the use of ODE. It is interesting to note the Nigeria, being the most populated country in Africa is a member of the 9 countries with the highest number of illiterates in the world and the Honourable Minister of Education of Nigeria occupied the Chair of the group from 2011 to 2013. Taking education to the grassroots in Nigeria will not only solve the problems of farmers and herder's clashes, but will boost all facets of the Nigerian Economy thus bring about improvement in standards of living and general development of the people. Education, the mother of all Arts *(Doctrina Mater Atrium)* will provide solutions to all the problems of the society be it man-made or natural.

Rehabilitation of Wild Herders and Farmers

The level of poverty and degradation of life style of the rural farmers and herders calls for urgent intervention in terms of rehabilitation programmes for their revival. This rehabilitation will be in terms of Adult Education and Education in Moral Values (EMV) to enable the wild farmers and herders understand the need for decent living, the ability to value their lives and that of others; the ability to treat others as they would want to be treated, the ability to be your neighbours' keeper and the ability to be considerate, to apply wisdom of judgement to issues, to exercise tolerance and understanding of religious, ethnic and gender issues in the society. The ability to love your neighbour as yourself is paramount to happy coexistence and living together in any community.

The rehabilitation programmes should include the provision of modern infrastructure to the communities. This should include building of access roads, provision of portable water, power and electricity, modern medical and health facilities and building of dwelling places, schools, worship centres and community centres and recreational avenues. Such programmes will revive the rural communities and reveal more reasons to remain alive than die in unprofitable communal crisis.



Fig. 14: Modern Health Facilities for Rural Communities

Reviewing of Grazing and Farming Policies

The laws and policies governing farming and rearing of livestock in Nigeria are now mostly outdated. They are outdated due to long time of existence and inability to fit into the modern prevailing situations facing Agriculture. The use of cattle routes and wondering about as nomads is old-fashioned and as good as condemning both man and his animals to a perpetual life of suffering and anguish. The laws should be reviewed to effectively establish sedentary mode of livestock production. The herders should be able to adapt the use of improved breeds of animals with very high productive characteristics. They should be introduced to effective ranching and range management all of which will reduce the present level of hardship experienced by both herders and the animals while moving from long distances to another within and outside the country in search of food and water. The intervention of the government in planning and execution of this ranching and range management will ensure greater results for the benefit of all stakeholders.



Fig. 15: Ranching and Sedentary Management of Cattle for Improved Production



Fig. 16: Improved Cattle Breed in Modern Pastures



Fig. 17: Local Unimproved Breed in Open Grazing

Similarly, there is need to review the laws guiding the traditional acquisition of land through inheritance for farming. As population expands the level of land fragmentations as increasing numbers offspring share the inherited land, will increase. This becomes a great obstacle to mechanisation of farm operations for higher and commercial production of crops. This might be very difficult to attain as changing culture and traditions is not an easy task, but nothing is insurmountable with objective positive will and focus of government. Equally important is the need to discourage unnecessary shifting cultivation amongst farmers and introduce modern agronomic and field management for higher crop yields to the farmers. The introduction and use of higher yielding varieties of crops that are of short duration, drought resistance, high resistance to insect pests and other diseases with high competitive abilities to weeds should be given more emphasis.



Fig. 18: High Yielding Varieties of Rice

Practical and Effective Agricultural Extension Services
The results of researches conducted in crops and animal production and management should be effectively conveyed or extended to the farmers and herders. This will make them more productive with less efforts. This will reduce he drudgery and frustration involved in their operations. Such frustration and suffering often fuel conflicts and clashes among farmers and herders in various communities in Nigeria. It is important for government and other corporate organisations to provide enough funding for Agricultural Extension in Nigeria. This will result to boosting the economic production of the farmers and herders and hence tremendous increase in the country's Gross Domestic Production (GDP) an important factor in the general economic growth of the country.

Population Growth
The rate at which Nigeria's population is expanding will soon lead to the inability of the land and natural resources to sustain or effectively meet the demand of the people. The more the number of people per square unit area, the lesser the quantity of resources per person. It is therefore very necessary for government to implement effective family planning and control that will ensure sustainable natural resources from the land. Population growth puts high pressure on land resources leading to unexpected crisis as a result of the principle of survival of the fittest. The use of the National Population Commission to effect laws that will ensure population control will result to better living and improvement of living standards with less conflicts and tension in the society.

Environmental Management and Control of Desertification
This can be achieved through planned Agricultural activities, controlled intensive farming using modern agricultural practices that reduce rapid degradation of land. Controlled grazing that discourages open and indiscriminate grazing of animals. The use of tree planting programmes to replace indiscriminate falling of trees and shrubs due to farming activities, grazing and firewood for cooking. Introduction of erosion control measures, use of proper drainage system even with farm and range lands to avoid flooding that will endanger both plant and animal life. Introduction of well-planned irrigation schemes that will ensure all year round usage of the land for greater production. Irrigation will enable

farmers to grow crops throughout the year thus increasing their productivity. Similarly, irrigation can allow the continuous production of forage and pasture for animal feed, adequate water for livestock use thus also increasing the productivity of animals for higher incomes for the herders. All these will reduce conflicts between famers and herders for grazing lands and water for their operations.

Peace Initiatives and Conflict Resolution

There is need for governments to foster dialogue between farmers and herders by strengthening mechanisms already existing at State and Local Government levels and supporting peace initiatives. Government should encourage religious and ethnic understanding and tolerance between the various faiths in the country. False preaching, hate speech amongst religions and ethnic or traditional leaders should be discouraged. Inter-religious and inter-tribal social organisations, clubs and society should be encouraged. This will create more understanding and harmonious living among diverse groups in the country.

Provision of Adequate Security

This cannot be overemphasised in combatting the menace of farmers-herders conflict in Nigeria. Insecurity is a major contributor to low agricultural productions in Nigeria today. This is because farmers and herders do not only suffer from their regular conflicts, but they are ell exposed to the dangers of kidnapping, armed robbery, banditry, insurgencies and terrorists' attacks. All these negative vices discourage farmers and herders from operating in their fields thus reducing the country's agricultural output.

Providing effective security to the grassroot who are major contributors to the national agricultural production cannot devoid itself from effecting sustainable practical systems such as the introduction of State Police, Community Police and strengthening of certified, identified local vigilante. The need for the host communities to cooperate with the security agencies is very paramount to the success of the security provision to the people. The host community should be able to identify strangers who have no business living among them. They should equally discourage their members from cooperating with strange criminals without which such criminals will not be able to find their routes for movement nor plan any attacks on the host communities. The control of possession of illegal arms and unnecessary proliferation of arms in the communities should be effectively monitored by security agents. This will bring about the general control of crime in the country. The need to end impunity and introduce fair justice amongst the communities will further strengthen the security system and reduce the prevalence of crime and criminality in the country. It is necessary for the Federal Government to order the investigation of all the incidents of farmer-herders violence that occurred in the country in the past years. Action should be expedited on the trials of individuals or organisations found to have participated, sponsored or been complicit in violence, cattle rustling, banditry, produce theft, wanton killings and destruction of life and properties all over the country.

Provision of Loans and Aids to Farmers and Herders

The facilities of the Bank of Agriculture, and other banks at low interest rates should be readily accessible to farmers and herders to improve their economic outputs. This will make life more meaningful to all stakeholders. International Aids donors should be encouraged to assist rural communities in their agricultural productions. They should be able to assist the Internally Displaced People (IDP) camps in many States of Nigeria many of which resulted from farmers-herders clashes apart from those from insurgency terrorism and banditry. International Development Agencies (IDAs) should cooperate and work with Nigerian authorities to offer technical and financial support to farmers and herders in Nigeria.

SUMMARY AND CONCLUSION

The struggle between Farmer and Herders is an old age problem that is not only peculiar to Nigeria alone. It results from the competition for limited land resources required for the production of their agricultural commodities. This had led to conflicts and wars in many communities globally. However, modern education and development has led to significant reduction and elimination of such clashes in many developed countries of the world.

The farmer-herder conflicts in Nigeria are caused by surmountable problems which are both man-made and natural. Effective and objective identification and understanding of these problems would provide sustainable and long lasting solutions to these avoidable and unnecessary communal clashes and conflicts that are responsible for retrogression and impeded growth and development in Nigeria.

REFERENCES

Blench, R. (2003). Transformation of Conflict between Pastoralists and Cultivators in Nigeria.http://www.rogerblench.info/conflict/herderfarmer%20conflict%20in%Nigeria.pdf.

Gundu, A. (2017). Opening Remarks presented at an International Conference titled "Herdsmen and Farmers Conflict": Learning from the Past, organised by the

Centre for Research Management held at the Benue State University on the 14-15 March, 2017.

Fagbemi, A., Lawal, I., Amzat, A., Wantu, J. & Akingboye, O. (2016). Menace of Fulani Herdsmen versus Host Communities. *The Guardian Newspaper*, January 8, p. 12.

International Crisis Group (2018) Stopping Nigeria's Spiralling Farmer-Herder Violence. Crisis Group Africa Report N°262, 26 July 2018.

International Crisis Group (2017) Herders against Farmers: Nigeria's Expanding Deadly Conflict, Crisis Group Africa Report N°252, 19 September 2017.

Tenebe, V. A. (2013). Progress Report on Open and Distanced Education in Nigeria. Paper presented at the Bi-annual General Conference of the 9 Countries with the Highest Population of Illiterates in the World, held at the Indira Ghandi National Open University (IGNOU), New Delhi, India. pp10.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

STOCK MARKET – RELATED FACTORS AND INVESTOR CONFIDENCE FOR SUSTAINABLE DEVELOPMENT: EVIDENCE FROM NIGERIA

Kareem Abidemi Arikewuyo
Department of Economics,
Tai Solarin College of Education, Omu-Ijebu, Nigeria
Tel: +234803 406 1631
E-mail: kareem.arikewuyo@yahoo.com

Abstract
The trading activities in the Nigerian capital market, that is bedeviled with persistent price volatility, has increased the risk associated with investment thereby threatens investor confidence. Low patronage of the capital market has serious implication on sustainable development of any nation as the interaction between surplus economic unit and deficit economic unit remains unsustainable. This study, therefore, examined the effect of stock market – related factors on investor confidence in Nigeria. Data were sourced from Nigerian Stock Exchange fact book and Central Bank of Nigeria statistical bulletin spanning 2008:1-2023:4. The statistical technique used was Autoregressive Distributed Lag (ARDL). Result revealed that market capitalisation of government securities for long – run and short – run had significant effect on investor confidence. The market capitalisation of debts/bonds for long – run and short – run) was insignificant while market capitalisation of equities for long – run and short – run was insignificant to investor confidence in Nigeria. This study concluded that stock market – related variables have no significant effect on investor confidence in both short-run long – run except market capitalization of government securities that was significant in both short – run and long-run in Nigeria. It is therefore recommended that corporate entities should be encouraged to embrace long – term financing as against short – term financing as this portends a great danger to the sustainable growth of the economy.

Keyword: *Stock market, investor confidence, debt market, equity market, ARDL*

1.0 INTRODUCTION
The investment in financial system is basically tied to trust and any item relating to trust requires having confidence in such a system. Investor confidence has been a major concern to financial market analysts, regulators, researchers and economists. Studies have shown that creative accounting being perpetrated by financial and accounting experts through account manipulations as well as volatility of stock price coupled with macroeconomic instability has created fear in the mind of investors, both individual and corporate, as the future returns are not guaranteed. There is no doubt that investor confidence has a great impact on the investible public interest in financial system. It is, however, crucial that maintaining investor confidence in the financial system, most especially capital market, will go a long way in emplacing sustainable development and growth of any nation.

Capital market has been adjudged to be one of the sub-sectors that propel the growth of any economy as it serves as an avenue to provide long-term funds to business entities (Adegboyega & Arikewuyo, 2014; Arikewuyo *et al.*, 2020). The In lending credence to the importance of stock market, Priye and Sangwan (2023) viewed stock market as a gauging tool for a nation's economic health.

Despite the role played by the stock market in the economic development of any nation, few households actual holds financial assets. Sound confidence is a driver to greater participation in both equities and bonds (Cupák, Fessler, Hsu & Paradowski, 2022). It is on this ground that Adegboyega and Arikewuyo (2014) opine that investor utilize information that is accessible to them as tools in trading available in the capital market. The implication of this is that investor relies heavily in available information which has great influence on investor confidence.

Investor confidence is viewed as the desire of investor to take advantage of investment opportunities with a view to receive return, either in the short or long term, based on associated risk. Once the return of the investor is threatened, the investor confidence remains frightened. The basic elements contained in investor confidence is trust as well certainty of returns but this is usually influenced by several factors which are both stock market -related and macroeconomic in nature. This kind of study is behavioural in finance because it lays emphasis on individual and corporate decision-making in stock market investment.

Arikewuyo (2023) emphasized the important role the stock market play in liquidity transformation and

improving capital accumulation which occasioned different financial reforms in the market. King and Levine (1993), Aduda et al (2014) as cited in Arikewuyo (2023) opines that a well-functioning and sound stock market will breed financial accessibility, risk reduction and exposure arising from high borrowing cost but a reverse of this situation would increase loss of confidence in the market.

Several factors have been adduced to loss of investor confidence in the stock market in sub-Saharan Africa countries, Nigeria inclusive, which ranges from price volatility, economic downturn and foreign exchange exposure that greatly impacted the trading activities in the stock exchange markets (Abanikanda & Akinbobola, 2023; Arikewuyo, 2023). The implication of this is inability to accumulate investible funds for long-term investment and sustainable development, hence economic retardation.

An investor goes to the market with the intent of buying and hold assets which may either be equity or debt securities for the purpose of financial returns or capital gain (Ko, 2017). One of the cardinals of investing in financial assets is trust and unfavourable reactions of investors to the capital market may be influenced by lack of confidence (Pouretemadi, Davaji, Khorasani & Saeedi, 2023). Public trust, that is, the trust that market participants place in the overall integrity of the institutional, legal, and political environment, is critical to capital markets. Ko (2007) is of the opinion that miscalculation of the true level of investor's protection in the economy may be due to distortion in investor trust. Kumar and Zattoni (2014) asserts that the growth and survival of public firms is dependent on maintaining confidence due to the fact that resources and capital are provided by outside investors. This further led credence to the consequences of information asymmetry as posited by Jensen and Meckling (1976). It is crucial to maintain investor confidence in public firms due to the importance of inflow of resources and capital by outside investors (Ley, Hashim & Embong, 2019).

Studies have revealed that large number of people in many countries does not participate in the stock market (Menkhoff & Westermann, 2024) and higher trading activity occurs when investor confidence soars. This implies that investors tend to have a higher risk appetite when confident by increased investment in small stock (Meier, 2018). Although, lack of confidence in economic condition where firms operate has made them to be cautious about investment (Janada & Teodoru, 2020) and this does not excludes Nigerian market and this has a significant effect on stock market participation in the Nigerian Exchange Market overtime. Aside this, Janada and Teodoru (2020) have identified detrimental business climate conditions, weak rule of law, limited investor protection or political instability as factors influencing investment.

Statistics have shown that there is drastic reduction in stock market participation in sub-Saharan Africa (SSA) as Arikewuyo *et al* (2020) have reported decline in initial public offerings (IPOs) in Nigeria as well as South Africa which signaled loss of confidence in the market. Further report has attributed low stock market participation to panic, persistent volatility and unstable macroeconomic factors which led to loss of confidence in the market. Little attention has been given to studies on investor confidence in relation to stock market – related variables as vast studies were concentrated on investor sentiment in developing and developed nations which necessitated the need for this study. This study therefore examines the relationship between stock market – related factors and investor confidence in stock market participation with reference to Nigerian exchange market.

2.0 LITERATURE REVIEW

The reluctance of corporate entities in raising long – term funds from the capital market and the averseness of investors, both individual and corporate, in stock market participation has posed a serious challenge to economic growth and development of Africa, Nigeria inclusive. This has placed a great challenge on the integrity of the financial markets which bothers on investor confidence in the long – run. In furtherance to this, investor confidence is the willingness of investors to engage in investment opportunities and associated intermediation channels available to them based on the perception of risk and return (Ko, 2017). Ogan and Adegbe (2022) viewed investor confidence as the degree to which investors receive a firm's disclosures and make investment decision based on such disclosure. The implication of this is that investor confidence can be arrived at based on previous information before an informed decision can be taken.

Kaustia, Conlin and Luotonen (2023) have found that wealth and education are highly significant predictors of stock market participation. Willingness to avoid financial risk is another contributory factor to stay away, implying that many are not convinced with the historically favourable long – term risk-return relationship of stocks. This culminated to the submission of Cupák, Fessler, Hsu and Paradowski (2022) that welfare losses could significantly be experienced where there exists low

engagement of households in equity markets. This, therefore, indicates that trust is one the factors affecting stock market participation.

A well-functioning and sound stock market broadens access to finance, reduce risk and vulnerabilities but achieving this requires active trading in the stock market (King & Levine, 1993; Aduda *et al*, 2014 as cited in Arikewuyo, 2023). It is on this premise that Gherig and Menhkoff (2004) opine that the behaviour of macroeconomic fundamentals play a significant role in the future expectation of investors which further influence the investor confidence in stock market participation, hence sustainable development. The economic downturn ranging from foreign exchange availability, unstable monetary policies as well as tough fiscal policies in recent years weakened the confidence of the investors towards investment in equities thereby resulting to low trading of the existing securities despite the cheap share valuation (Bagga, 2016; Abanikanda & Akinbobola, 2023).

The study of investor confidence came into limelight through the study of Shiller (2020) where he appraised the attitude changes among investors in United States stock market. The study employed survey research design using indexes of negative expectations and investor confidence. It was discovered that bubble expectations and investor confidence do vary through time and established that these variations are often significant but not so enormous. In the theoretical work of Chang, Yu, Reinstein and Churyk (2016) investigated how investment sentiment is measured and its impact on stock market. It was found that investor sentiment can impact the stock market.

Janada and Teodoru (2020) examined how confidence influences private investment in selected countries of Central America. The study employed vector error correction model covering March 2023 – June 2018 and it was found that global shocks and confidence are the most important drivers in explaining private investment. The major shortcoming of this study was the use of different confidence indexes for different countries and varying periods were covered. In another dimension, Ley, Hashim and Embong (2019) investigated the association between board characteristics and firm value taking into consideration the role of investors' confidence in Malaysia. The study employed partial least square structure model covering 2016. The study failed to establish any mediating effect of investors' confidence on the tested characteristics except CEO duality that influence firm value.

Yeh and Ling (2021) examined how over-confidence with respect to one's financial literacy affects stock market participation in Japan. The study covered 2015 and analysed data with probit regression. It was found that financial literacy plays a positive role while confidence in financial literacy also matters. Cupák, Fessler, Hsu and Paradowski (2022) carried out a study on investor confidence and high financial literacy jointly shape investments in United State of America risky assets. The study used survey research unconditional quartile regression covering 2019 and it was found that lack of investor self – confidence or fear of risk posed a barrier to investing in risky assets particularly in stock market participation.

The standard static portfolio model prediction suggests the need for household to invest certain percentage of their wealth in stock markets but empirical studies revealed that a significant proportion of the households do not participate in the stock market. A vast number of studies revolved around investor sentiment as a determinant of stock market participation. It is evident that the reverse relationship between stock market – factors and investor confidence in stock market participation is largely sparse. In view of this, this study differs from the previous studies in significant ways. First, previous studies ignored the influence of macroeconomic factors on investor confidence which this study considered as these factors impact on the wealth of households. Second, this study improved on the measurement of investor confidence by considering successive changes of number of deals over a period to ascertain changes in investor risk appetite in stock market participation.

3.0 DATA AND METHODOLOGY

This study used quarterly data covering the period of 2008:1 and 2023:4 to examine the relationship between stock market – related factors and investor confidence in Nigerian stock market participation for sustainable development The independent variables used was disaggregated into three (3) to include number of deals (NDL), market capitalisation of government stocks (MKS), market capitalisation of debts/bonds (MKD) and market capitalisation of equities (MKE) while macroeconomics used were monetary policy rate to capture interest rate (INT), inflation rate (IFL), money supply (MNS) and exchange rate (ERT). The study employed autoregressive distributed lag (ARDL) to analyse data and data were sourced from Nigerian exchange market fact book and Central Bank of Nigeria Statistical Bulletin (various issues).

The general form of model for this study is stated in

Equation 3.1:

$$Y_t = \varphi_i X_t + \eta_i Z_t + \varepsilon_t \qquad 3.1$$

The independent variables, X_t and Z_t, are decomposed to produce Equations 3.1.1 and 3.1.2 respectively

X_t = (mks_t, mkd_t, mke_t) *3.1.1*

Z_t = (int_t, ifl_t, ert_t, mns_t) *…3.1.2*

where

Y_t = no. of deals at period t which was measured as changes in successive number of deals overtime;

φ_i = vector of stock-market related variables at period t;

P_t = vector of macroeconomic variables at period t;

Φ_i = coefficients of each independent variables relating to stock market – related variables;

η_i = coefficients of each independent variables relating to macroeconomic variables;

ε_t = vector of error terms

However, ascertaining the investor confidence of the current period is consequent upon the perception of trading activity of the previous period against the current variable used to capture investor confidence. . The implication of this is that there is need to lag all variables considered in this study.

The study adapted the work of Olokoyo et al. (2014). Their model was calibrated to accommodate the nature of the behaviour of instruments traded in the market by using quarterly data as against annual data and consideration of the macroeconomic variables which previous studies ignored. The linear relationship considering Equations 3.1 - 3.12 is presented in Equations 3.2:

$$NDL_t = \alpha_0 + \alpha_1 MKS_t + \alpha_2 MKD_t + \alpha_3 MKE_t + \alpha_4 INT_t + \alpha_5 IFL_t + \alpha_6 ERT_t + \alpha_7 MNSt + \varepsilon_t \qquad 3.2$$

The ARDL model for Equation 3.2 is stated in Equation 3.3:

$$\Delta ndl_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta ndl_{t-1} + \sum \alpha_2 mks'_{t-1'} + \sum \alpha_3 mkd'_{t-1} + \sum \alpha_4 mke'_{t-1} +$$

$$\sum \alpha_5 \text{int}'_{t-1} + \sum \alpha_6 ifl_{t-1} + \sum \alpha_7 ert_{t-1} + \sum \alpha_8 mns_{t-1} + \alpha_9 ndl_{t-1} + \alpha_{10} mks'_{t-1} + \ldots 3.3$$

$$\alpha_{11} mkd'_{t-1} + \alpha_{12} mke'_{t-1} + \alpha_{13} \text{int}'_{t-1} + \alpha_{14} ifl'_{t-1} + \alpha_{15} ert'_{t-1} + \alpha_{16} mns'_{t-1} + \varepsilon_i$$

Where;

NDL =No. of deals to capture investor confidence;

MKS= Market Capitalisation of Government Stocks;

MKD = Market Capitalisation of Debts/Bonds;

MKE = Market Capitalisation of Equities;

INT = Interest Rate;

IFL = Inflation Rate;

ERT = Exchange Rate;

MNS = Money Supply;

α_0 = intercept term; and

α_1 - α_{16} = parameters to be estimated

4.0 RESULTS AND DISCUSSION

4.1 DESCRIPTIVE STATISTICS

In Table 4.1, the average investor confidence measured with fluctuations in no. of deals (NOD) in the period under study was 16,039.52 with a standard deviation of 4.624 which shows that the risk associated trading activities in the stock market. The skewness value of 1.26 indicates that no. of deals is positively skewed from the expected value while the kurtosis value of 2.71 reveals that suggests that the distribution of no. of deals was mesokurtic in nature.

The mean point for market capitalization of government stocks/securities (MKS) was ₦6.43E+10 with a standard deviation of 6.437. The skewness value of 6.437 is positively skewed. The kurtosis of 2.4332 shows that it is mesokurtic in nature while JB shows the variable is normally distributed at 5%. The average of market capitalization of debts/bonds volatility (MDV) was ₦ 3.26E+10 with a standard deviation of 8.025. The skewness value of 2.32 is an indication that market capitalization of debts/bonds is positively skewed.

Table 1: Descriptive Statistics

	NDL	MKS	MKD	MKE	INT	IFL	ERT	MNS
Mean	16039.52	6.43E+10	3.26E+10	8.01E+11	14.27	15.27	372.13	14.95
Median	29348.17	2.23E+10	1.31E+10	3.98E+11	13.92	15.34	14.73	9.08 E+10
Std. Dev.	2.624	6.437	8.025	5.653	3.54	5.01	67.22	56.90
Skewness	1.26	1.31	2.32	1.48	0.85	0.21	4.74	2.02
Kurtosis	2.71	2.61	12.51	2.65	5.17	4.93	28.61	1.93
No. Of Observation	63	63	63	63	63	63	63	63

Source: Author, 2024

The kurtosis value of 12.51 suggests that the distribution of market capitalization of debts /bonds in Nigerian exchange market was leptokurtic. In the same vein, market capilation of equities had a mean score of 8.01E+11per quarter with a standard deviation of 5.653 showing deviations from the mean. The skewness value of 1.48 indicates positive skewness while the kurtosis of 2.65 suggests that the distribution of market capitalization of equities was platykurtic.

Interest rate revealed an average of 14.27% per quarter having a standard deviation of 3.54. the skewness value of 0.85 which shows that interests rate is positively skewed while kurtosis value of 5.17 suggests that the distribution of interest rate was leptokurtic in Nigeria. More so, the mean point of inflation was 15.27 per quarter in Nigeria within the period covered with standard deviation of 5.01. The skewness value of 0.21 is positively skewed from the expected value while the kurtosis value of 4.93 which suggests that the distribution was leptokurtic.

In addition, the average value of exchange rate in Nigeria was ₦372.13 with a standard deviation of 67.22 which showed high deviation from the mean during the period under study. The skewness value of 4.74 shows positive deviation from the expected value while the kurtosis value of 28.61 suggests that the distribution of the exchange rate was leptokurtic.

The money supply (MNS) was on average value of ₦ 14.95 million with a standard deviation of 56.90 which

indicates that high deviation of money supply (MNS) from mean value during the period under study. The skewness value of 2.02 displayed a positive skewness while the kurtosis value of 1.93 showed a leptokurtic distribution during the period under study.

4.2 Stationarity Test

Table 2: Stationarity Test

Variable	Model Specification	@ Level	@1st Difference	Order of Integration
NDL	ADF	-3.078	-	I(0)
MKS	ADF	-	-9.281	I(1)
MKD	ADF	-3.839	-	I(1)
MKE	ADF	-	-6.227	I(1)
INT	ADF	-	-4.929	I(1)
IFL	ADF	-	-5.361	I(1)
ERT	ADF	-	-4.728	I(1)
MNS		-	-6.824	I(1)

Source: Author, 2024

The variables of this study were subjected to unit root test to ascertain the stability of the variables and to justify an appropriate technique used. From Table 4.2, all variables considered were stationary at 5 per cent level of significance, though at varying specifications.

The outcome of the Augmented Dickey Fuller (ADF) unit root test revealed that variables displayed different order of integration, I(0) and I(1), which indicated short and long – run relationship (ARDL) among variables of this study (Pesaran, Shin & Smith, 2001). The Vector Autoregression (VAR) lag order selection criterion was seven (7). The ARDL bound test was displayed in Table 4.3 which showed a long run equilibrating relation between stock market – related factors and investor confidence in stock market participation in Nigeria with F-statistic of 22.099 at 5% level of significance. The diagnostic statistic for this study revealed absence of serial correlation and heteroscedasticity ($p<0.005$) which implied that the model was reliable. Findings revealed that explanatory variables included were of good fit and explained by about 80%.

In the process of conduction ARDL bound test, the optimal lag length found was 2. The ARDL bound test has F-statistic value of 3.61 as shown in Table 4.3 indicates that it falls within the upper bound critical

Table 3: Result of ARDL Bound Test

Estimated Equation: *NDL = f(MKS, MKD, MKE, INT, IFL, ERT, MNS)*		
F-statistic	3.61	
Optimal lag length	(1, 2, 1, 0, 0, 0, 2, 0)	
Significance level	Critical values	
	Lower bound	Upper bound
1%	2.96	4.26
5%	2.32	3.50
10%	2.03	3.13
Diagnostic Statistic:		
R^2	0.7204	
Adjusted R^2	0.5230	
F-statistic	3.6493 (0.0001)	
Breusch-Godfrey Serial Correlation LM Test	18.6618 (0.0003)	
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.8671 (0.4811)	
Jacque-Bera (JB) Normality	13.6548 (0.0421)	
Specification Error – Ramsey RESET Test	23.1531 (0.0000)	

Source: Author, 2024

{*, **} reject null hypothesis at 1% and 5% level of significance respectively.

value of 5 per cent which is an indication of rejecting the null hypothesis thereby concluding that there is long-run equilibrating relationship between stock market – related factors and investor confidence in stock market participation for sustainable development in Nigeria. The result of diagnostic statistic revealed that the residuals are serially uncorrelated, homoscedastic, normally distributed based on Breusch-Godfrey serial correlation LM test, ARCH L- test and JB test. This is an indication that the model is of good fit for economic policy recommendation. The Ramsey RESET test also showed that the model is well specified.

To further establish the stability of the model was the results of CUSUM and CUSUM-SQ which were within the acceptable bound of 5 per cent and it is an indication of constancy of the short-run dynamics of the long-run parameters for policy recommendations as shown in Fig. 4a and 4b.

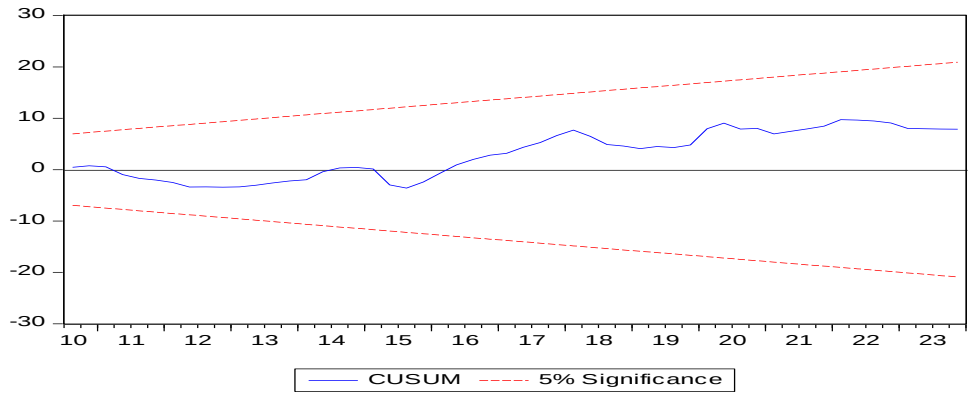


Figure 4a: CUSUM Graph

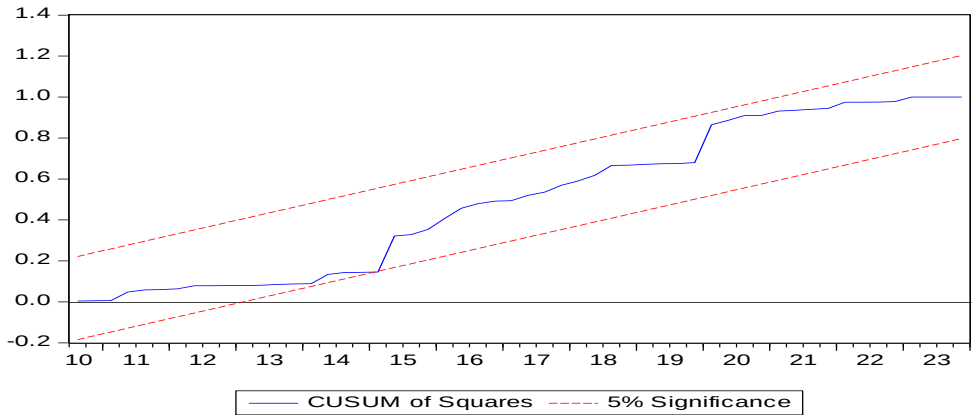


Figure 4b: CUSUM-SQ Graph

Table 4 showed the short-run findings of this study which showed that some variables were significant to investor confidence in stock market participation in Nigeria. The short-run coefficient (ECM) was

Table 4: Short-Run of ARDL Results (1, 2, 1, 0, 0, 0, 2, 0) Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(MKS)	-0.0548	0.0316	-1.7321	0.0897
D(MKS(-1))	0.0539	0.0260	2.0745	0.0434
D(MKD)	0.3225	0.1669	1.9328	0.0592
D(MKE)	0.0082	0.0108	0.7644	0.4484
D(INT)	9052.56	11828.00	0.7653	0.4478
D(IFL)	-87757.97	143995.54	-0.6094	0.5451
D(ERT)	-930.59	1037.47	-0.8970	0.3742
D(ERT(-1))	2936.65	1296.54	2.2650	0.0281
D(MNS)	0.0015	0.0043	0.3630	0.7182
Coint. Eq.(-1)	-0.4304	0.1155	-3.7247	0.0005

Source: Author, 2024

correctly signed and statistically significant at 5%. The implication of this is that about 66% departure from long-run equilibrium was corrected in each quarter. This connotes that the magnitude of adjustment mechanism (ECT) shows the speed of adjustment towards long-run equilibrium is high as 66% disequilibrium from the previous year will converge back to the long-run in the current year. The result of ARDL revealed that only two variables were found to be significant, in the short-run, at 5%. It was found that previous market capitalization of government securities (MKS) and previous exchange rate have significant effect on investor confidence in stock market participation

What this connotes is that Nigerians invest in government-owned securities than any other form of securities in Nigeria. The economic implication is that government's ability to raise funds manage debts, whether treasury bills or bonds, is assured as Nigerians repose confidence in trading in government securities than other securities. This may be as a result of credit worthiness and reliability of governments in meeting its short and long-term obligations which other deficit-economic units in the market could not meet.

This also has a far-reaching effect and it suffices that the investors in Nigerian exchange markets are risk-averters. This is in tandem with the submission of Kaustia, Conlin and Luotonen (2023) which asserted that one of key factors influencing investor confidence in stock market participation is willingness to avoid financial risk and this is against investment theory of risk-return trade off. The economic implication of this is that investors in Nigerian capital market have preference for risk-free assets which implies that there would be little investible funds for corporate firms which poses a great threat to industrial development of the nation and by extension have serious implication on employment level as well as buoyant economic activities that can promote commerce and trade in the economy thereby threatens the sustainability development of the nation.

More so, the positive significance of exchange rate on the investor confidence in stock market participation in Nigerian exchange market indicates that exchange is one of the determining factor of investor confidence in stock market participation in Nigeria. The economic implication of this is that Nigerian capital market is highly dominated by foreign investors. This poses a great threat to the sustainable development of Nigeria. The economic implication is that the non-favourable of the economic downturn may scare the foreign portfolio investors away and this would have a grievous effect on the Nigerian exchange market and the country at large.

The ARDL long-run coefficients results in Table 5 revealed that all variables of stock market –related factors as well as macroeconomic variables were not significant except market capitalization of government securities and exchange rate, though negative, on investor confidence in stock market participation in Nigeria. This means that there is behavioural shift in economic fundamentals in Nigeria

Table 5: Long–Run Coefficients of ARDL (1, 2, 1, 0, 0, 0, 2, 0) Model

Variable	Coefficient	S. Error	T-stat	P – value
MKS	-0.4105	0.1299	-3.1601	0.0357
MKD	0.0054	0.0370	0.1452	0.8852
MKE	0.0192	0.0251	0.7647	0.4482
INT	21033.91	28421.30	0.7401	0.4629
IFL	-203908.5	350395.90	-0.5819	0.5633
ERT	-1.3104	0.5285	-2.4795	0.0417
MNS	0.0037	0.0100	0.3581	0.7218
C	748936.72	1535093.18	0.4879	0.6279

Source: Author, 2024

exchange market. The findings of this study is in agreement with the previous submission of Abanikanda and Akinbobola (2023) as well as Arikewuyo (2023).

The negative and significant effect of market capitalization of government securities on investor confidence in stock market participation has far-reaching economic implications. The findings of this study has been able to ascertain that low participation in stock market thereby reducing investor confidence in risky assets by crowding out private sector investment for government securities. What can be deduced is that investors perceive high level of risk in private investments and thereby prefer holding government securities which resulted in liquidity reduction and dampens capital formation as well as economic growth of Nigeria in the long-run.

Furthermore, the economic implications include the increase in government borrowings which will promote high cost of capital for firms. This will definitely lead to further reduction in stock market participation due to loss of confidence in the market which threaten sustainable development of the country through Nigerian stock market.

Also, the negative and significant effect of exchange rates has great influence on investor confidence in stock market participation for sustainable development. This is an indication that exchange volatility has great influence on the confidence of investors in Nigeria which further reduces the participation in the Nigerian stock market because the investors perceived inherent risk involved in a country which currency is unstable. This may also breeds imported inflation and would promote capital flight. This portends economic crisis as foreign investors may lose confidence and be prevented from further investing in such economy thereby reducing foreign capital inflow. The economic implication is the lower participation in stock market thereby leading to reduced stock market liquidity which has long – term effect on capital formation as well as economic growth of the country. This submission is in consonance with submission of Abanikanda and Akinbobola (2023) as well as Arikewuyo (2023). To further buttress the implication of negative effect of exchange rates is the negative but insignificance of the interest rates which actually lend credence to the fact that a weaker currency of a particular country would lead to imported inflation thereby promote loss of confidence in the trading activities in the Nigerian exchange market

5.0 CONCLUSION AND POLICY RECOMMENDATIONS

Stock market participation plays a significant role in economic fortunes of any economy. This study sets out to investigate the nexus between stock market – related factors and investor confidence in stock market participation for sustainable development in Nigeria. Stock market – related variables were decomposed into market capitalization of government securities, that of debt and stocks while some macroeconomic factors were included in the model. Of all the three stock market – related factors, only market capitalization of government stocks was significant, in both short and long – run, on investor confidence while other variables were not significant. It was also found that among four macroeconomic variables considered in this study, only exchange rates had significant, though negative short and long – run, on investor confidence in stock market participation in Nigeria.

The study recommends that the regulators and government should synergize through reforms to promote private sector investment in Nigeria so as to improve stock market participation for sustainable development.

There is need for government to strengthen investor protection regulations and corporate governance rules to repose the lost confidence in the market as this would improve stock market participation in Nigeria, thus sustainable economic growth and development in Nigeria.

The monetary authorities should emplace policy adjustments that will reduce exchange volatility and encourage export – oriented industries as well as economic diversification in order to achieve exchange rate stability and economic resilience for sustainable economic growth in Nigeria.

The government should devise alternative funding sources to reduce over-reliance on government securities and the need to develop stock market infrastructure to increase efficiency and stock market participation to achieve sustainable development in Nigeria.

REFERENCES

Abanikanda, E. O., & Akinbobola, T. O. (2023). Does financial deepening matter in the nexus between exchange rate volatility and foreign investment? insight from Nigeria. *African Journal of Economic Review, 11*(1), 33 – 49.

Adegboyega, R. R. & Arikewuyo, K. A. (2014). Capital market and business development in Nigeria, *UNIOSUN Journal of Politics and Society, 5*(1&2), 9-26.

Aduda, J., Chogii, R & Maina, T. M. (2014), Effect of capital market deepening on economic growth in Kenya, *Journal of Applied Finance and Banking*, 4(1), 141 - 159

Arikewuyo, K. A., Adeyemi, A. A., Omodara, E. T. & Yunusa, L. A. (2020). Reconciling macroeconomic determinants with stock market performance in some selected Sub – Saharan Africa: An ARDL approach, *Journal of Banking and Financial Economics, 1*(13) 2020, 23-39.

Arikewuyo, K. A. (2023). Dynamic effect of exchange gap shocks on stock market deepening: Evidence from Nigeria. *CBN Journal of Applied Statistics, 14*(1), 93 – 120.

Aduda, J., Chogii, R., & Maina, T. M. (2014). Effect of capital market deepening on economic growth in Kenya. *Journal of Applied Finance and Banking, 4*(1), 141 – 159.

Bagga, R. (2016). Nigerian stock market: Review of 2016 and outlook for 2017. Retrieved from proshare.com/newscategory/review.

Chang, A., Yu, S., Reinstein, A. &Churyk, N. T. (2016). An overview of investor sentiment in stock market. *Journal of Business, 78*(2), 405 – 440.

Cupák, A., Fessler, P., Hsu, J. W. & Paradowski, P. R. (2022). Investor confidence and high financial literacy jointly shaped investments in risky assets. *Economic Modelling*, 116.

Gherig, T. & Menhkoff, L.(2004), The use of flow analysis in foreign exchange: explanatory evidence, *Journal of Economics and Behavioural Studies*, 4(11), 649 – 659.

Ko, K. Z. (2017). Economics note: investor confidence. Retrieved from https://www.sec.gov/files/investor_confidence_oct2017.pdf

Janada, C. & Teodoru, I. R. (2020). Confidence as a driver of private investment in selected countries of CentralAmerica. *IMF Working Paper WP/20/270*, 1 – 30.

Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behaviours agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360

Kaustia, M., Conlin, A. & Luotonen, N. (2023). What drives stock market participation? The role of institutional, traditional and behavioral factors. *Journal of Banking and Finance, 148*, 1 – 21.

King, R. G. & Levine, R. (1993), Finance and growth: Schumpeter might be right, *Quarterly Journal of Economics*, 108(3), 717 – 736.

Kumar, P. & Zattoni, A. (2014). Corporate governance, information and investor confidence. *Corporate Governance: An International Review, 22*(6), 437 – 439.

Ley, L. A., Hashim, F. & Embrong, Z. (2019). Board characteristics, investors' confidence and firm value: Malaysian evidence. *Asian Journal of Accounting and Governance, 12*, 169 – 181.

Menkhoff, L. & Westermann, J. (2024). Determinants of stock market participation. DIW Berlin Discussion Paper No. 2078, Available at SSRN: https://ssrn.com/abstract=4802685 or http://dx.doi.org/10.2139/ssrn.4802685

Meier, C. (2018). Aggregate investor confidence in the stock market. *Journal of Behavioural Finance, 19*(4), 421 – 433.

Ogan, T. P. & aadegbe, F. F. (2022). Corporate financial reporting and investor confidence in Nigeria. *International Journal of Economics, Management, Business and Social Science, 2*(3), 564 – 578.

Olokoyo, F. O., Oyewo, B. M. & Babajide, A. A (2014). Attitude of investors to capital and money market investment before and after financial crisis: Evidence from Nigeria. *International Journal of Sustainable Economics Managements, 1*, 53- 64.

Pouretemadi, M., Davaji, J. G., Khorasani, M. B. & Saeedi, P. (2023). Policies to gain investors' confidence in relation to unexpected profits with the moderating role of historically low profit management (experimental evidence: Iran's capital market). *International Journal of Political Economy, 4*(1), 243 – 271.

Priye, D. & Sangwas, S. (2023). A study of students' stock market participation and awareness. *Journal of Scientific Research and Technology, 1*(7), 70-90.

Shiller, R. J. (2000). Measuring bubble expectations and investor confidence. *The Journal of Psychology and Financial Markets, 1*(1), 49 – 60,

Yeh, T. & Ling, Y. (2021). Confidence in financial literacy, stock market participation and retirement planning. *Journal of Family and Economic Issues, 43*(1), 169 -186.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

MECHANIZATION POLICY INNOVATION FOR INCLUSIVE SUSTAINABLE DEVELOPMENT: A REVIEW

***[1]Buba Baba Shani, [1]Aliyu Musa & [2]Hannatu Yohanna Michael**
[1]Department of Crop and Soil Sciences, National Open University of Nigeria
[2] Department of Agriculture Economics and Rural Sociology, National Open University of Nigeria
[3]Department of Economics, National Open University of Nigeria, Nigeria
*Corresponding Author Email: bshani@noun.edu.ng

ABSTRACT
Mechanization stands as a cornerstone in the narrative of global food production, enabling increased yields to meet the escalating demands of an ever-expanding population. This paper delves into an exhaustive examination of mechanization's multifaceted impacts, spanning economic growth, operational efficiency, and overall productivity across diverse sectors. Yet, it does not shy away from shedding light on the environmental repercussions that accompany this technological advancement across diverse sectors. Nevertheless, it underscores the critical need for sustainable practices and innovative solutions to mitigate these impacts. By championing inclusivity, equity, and sustainability, stakeholders, including policymakers and businesses, are poised to harness the transformative potential of mechanization while mitigating its adverse effects. This entails not only reaping its economic benefits but also ensuring that marginalized communities and ecosystems are not left behind or adversely affected. A paradigm shift towards inclusive mechanization policies is imperative. Such policies must integrate social, economic, and environmental considerations, recognizing the intricate interplay between these domains. By doing so, they can pave the way for a future where mechanization serves as a catalyst for holistic development, fostering both economic prosperity and environmental stewardship. In essence, this paper underscores the urgency of embracing a holistic approach to mechanization—one that transcends mere economic gains to encompass broader societal and environmental imperatives. By aligning mechanization policies with principles of inclusivity and sustainability, we can chart a course towards a more equitable and resilient future for present and forthcoming generations alike.

Keywords: *Equity, Inclusive growth, Mechanization, Policy innovation, Sustainable development*.

1.0 INTRODUCTION

Mechanization refers to the process of using machinery, equipment, and technology to perform tasks that were traditionally done by hand or with animal power. It has revolutionized various sectors, including agriculture, manufacturing, transportation, and construction, by increasing efficiency, productivity, and output. Mechanization has led to significant advancements in industrialization, allowing for mass production, improved infrastructure, and enhanced living standards.

Mechanization has spurred profound transformations in agriculture, manufacturing, transportation, and construction, driving efficiency, productivity, and output (Smith, 2020). In agriculture, the adoption of mechanization tools such as tractors and harvesters has significantly increased productivity by optimizing planting and harvesting processes, thus contributing to food security amidst a burgeoning global population (Abdulai & Johnson, 2019). Similarly, in manufacturing, automation and advanced technologies have streamlined production processes, leading to higher output levels and improved product quality (Mallory *et al*., 2019). Moreover, mechanized transportation systems have revolutionized the movement of goods and people, enhancing accessibility to essential services and facilitating economic development (Wang & Zhang, 2017).

In agriculture, mechanization has played a crucial role in increasing food production to meet the growing demands of a rapidly expanding global population. Tractors, harvesters, irrigation systems, and other agricultural machinery have enabled farmers to cultivate larger areas of land, optimize planting and harvesting processes, and reduce labor-intensive tasks. This has not only boosted agricultural productivity but also transformed rural economies and livelihoods.

In manufacturing, mechanization has transformed production processes, leading to higher output levels, reduced production costs, and improved product quality. Automation, robotics, and advanced manufacturing technologies have streamlined assembly lines, enhanced precision and accuracy, and enabled the production of complex products at scale. This has driven economic growth, job creation, and technological innovation in the manufacturing sector.

Mechanization has also revolutionized transportation and logistics, facilitating the movement of goods and people across long distances with greater speed, efficiency, and safety. Automobiles, trains, ships, and airplanes have become indispensable modes of transportation, connecting markets, facilitating trade, and driving economic development. Furthermore, mechanized transportation systems have improved access to education, healthcare, and other essential services, particularly in rural and remote areas.

Inclusive sustainable development, a development paradigm aimed at fostering economic growth, social equity, and environmental stewardship simultaneously, emphasizes equitable distribution of development benefits and environmental conservation (Rajaram et al., 2020). It recognizes the interconnectedness of economic, social, and environmental objectives and seeks to address the root causes of poverty, inequality, and environmental degradation (Gupta et al., 2019). Key principles of inclusive sustainable development include equity and social justice, participation and empowerment, environmental sustainability, and resilience and adaptive capacity (Lobell et al., 2017).

Unlike traditional development approaches, which often prioritize economic growth at the expense of social welfare and environmental sustainability, inclusive sustainable development recognizes the interdependence of economic, social, and environmental objectives. It seeks to address the root causes of poverty, inequality, and environmental degradation by fostering inclusive economic opportunities, promoting social inclusion and cohesion, and adopting environmentally sustainable practices.

Key principles of inclusive sustainable development include ensuring fair and equitable access to resources, opportunities, and benefits for all members of society, regardless of socioeconomic status, gender, ethnicity, or other characteristics; engaging communities, civil society organizations, and marginalized groups in decision-making processes and development initiatives to ensure their voices are heard, their needs are addressed, and their rights are protected; promoting responsible stewardship of natural resources, minimizing environmental degradation, and mitigating climate change impacts to safeguard the health and well-being of current and future generations; and building resilience to shocks and vulnerabilities, such as economic downturns, natural disasters, and climate change, by investing in adaptive capacity, social safety nets, and sustainable infrastructure.

Inclusive sustainable development requires integrated and holistic approaches that balance economic, social, and environmental considerations to achieve long-term prosperity, human well-being, and ecological integrity. It recognizes that sustainable development is not just about economic growth but also about improving the quality of life for all people and preserving the planet for future generations.

The paper aims to conduct a comprehensive analysis of the impacts of mechanization on various aspects such as economic growth, efficiency, and productivity across different sectors. It also seeks to highlight the potential environmental consequences associated with mechanization, including issues such as resource depletion, pollution, and habitat destruction. Furthermore, it emphasizes the importance of prioritizing inclusivity and equity in mechanization policies to ensure that the benefits are accessible to all segments of society, including marginalized communities. Additionally, the paper advocates for the integration of sustainability principles into mechanization policies to minimize negative environmental impacts and promote the long-term well-being of present and future generations. Finally, it aims to propose innovative policy frameworks and strategies that can effectively balance the economic, social, and environmental dimensions of mechanization, thereby fostering inclusive and sustainable development.

2.0 METHODOLOGY

The methodology employed a mixed-methods approach to comprehensively analyze the impacts of mechanization on economic growth, efficiency, productivity, environmental sustainability, and social inclusivity. It began with a systematic literature review that synthesized existing knowledge from academic databases such as Google Scholar, JSTOR, and PubMed. Key themes included the economic, environmental, and social dimensions of mechanization, identifying gaps and informing subsequent phases.

The study conducted a case study analysis focusing on successful mechanization policies in India, Brazil, China, Ethiopia, and Vietnam. These countries were selected based on criteria including policy impact, geographic diversity, and data availability. Data was gathered from government reports, academic articles, policy documents, and interviews with stakeholders. Comparative analysis identified best practices in policy design, implementation strategies, challenges faced, and outcomes achieved across economic, environmental, and social dimensions.

Policy framework development aimed to integrate insights from the literature review and case study analysis into innovative frameworks balancing economic, social, and environmental goals. This phase involved formulating specific policy recommendations for inclusive sustainable development, emphasizing

economic growth, efficiency, productivity improvements, environmental impact reduction, and social inclusivity promotion. Consultation with experts and stakeholders refined these frameworks to ensure practicality and effectiveness.

The study relied on primary data from interviews with policymakers, farmers, and industry experts, complemented by secondary data from academic journals, government publications, policy reports, and international organization databases. Ethical considerations were upheld with institutional review board approval, ensuring confidentiality and voluntary participation. Despite limitations such as potential biases in self-reported data and the study's focus on specific case studies, the methodology provided a robust framework for generating valuable insights and actionable policy recommendations.

3.0 RESULTS AND DISCUSSION

3.1 The Role of Mechanization in Sustainable Development

Mechanization significantly contributes to economic growth, efficiency, and productivity across various sectors through several key mechanisms (Smith, 2020): Mechanization automates and streamlines tasks, reducing the time and labor required to complete them (Abdulai & Johnson, 2019). In agriculture, for example, mechanized equipment such as tractors, harvesters, and irrigation systems enable farmers to cultivate larger areas of land, plant and harvest crops more efficiently, and optimize inputs such as water and fertilizer (Lobell et al., 2017).

Mechanization often reduces production costs by minimizing the need for manual labor and increasing the speed and accuracy of production processes (Mallory et al., 2019). In manufacturing, for instance, automation and robotics can lower labor costs and improve precision in assembly lines, resulting in higher output levels and lower unit costs per product (Gupta et al., 2019). Mechanization saves time by completing tasks more quickly and consistently than manual labor (Rajaram et al., 2020), allowing businesses to increase their production capacity, meet customer demands more effectively, and capitalize on market opportunities. In transportation, mechanized vehicles such as automobiles and airplanes enable faster and more reliable travel, facilitating trade, commerce, and economic exchange. The development and adoption of mechanized technologies drive technological innovation and advancements in various sectors (Smith, 2018), with innovations in machinery, equipment, and automation technologies continually improving efficiency, productivity, and performance, leading to further economic growth and competitiveness (Wang & Zhang, 2017).

However, mechanization also poses potential environmental impacts, particularly if not managed sustainably. Mechanization can lead to the depletion of natural resources if not used efficiently (Lobell et al., 2017). For example, intensive agricultural mechanization may increase water consumption for irrigation or lead to soil degradation through excessive tillage, affecting water quality and ecosystem health. Some mechanized processes generate pollution and emissions that can harm the environment and human health (Gupta et al., 2019). In manufacturing, for instance, industrial machinery may produce air and water pollutants, contributing to air and water pollution and climate change. Mechanization can result in habitat destruction and biodiversity loss, particularly in natural and ecologically sensitive areas (Abdulai & Johnson, 2019). For example, the expansion of mechanized agriculture may lead to deforestation, wetland drainage, and land conversion, threatening biodiversity. Improper mechanized practices can degrade soil quality, increase erosion, and contaminate water sources (Rajaram et al., 2020). These impacts can reduce soil fertility, degrade water quality, and harm aquatic ecosystems.

Given these potential environmental impacts, it is crucial to adopt sustainable practices and technologies to mitigate the negative effects of mechanization: Utilize mechanized technologies and practices that maximize resource efficiency and minimize waste (Mallory et al., 2019). Implement environmental management practices to mitigate the environmental impacts of mechanization (Smith, 2018). Establish and enforce regulatory frameworks and standards to govern mechanized activities and ensure compliance with environmental regulations (Wang & Zhang, 2017). Invest in research and development of sustainable mechanization technologies and practices to minimize environmental impacts (Gupta et al., 2019).

Overall, while mechanization offers significant economic benefits in terms of growth, efficiency, and productivity, it is essential to adopt sustainable practices and policies to mitigate its potential environmental impacts and promote inclusive and sustainable development. By integrating economic, social, and environmental considerations, policymakers, businesses, and stakeholders can harness the benefits of mechanization while safeguarding the planet for future generations.

3.2 Challenges to Inclusive Development

Identifying barriers to inclusive growth in the context of mechanization involves recognizing challenges that hinder equitable access to technological advancements and resources, as well as understanding the potential social consequences, such as labor displacement:

Unequal Access to Technology and Resources:

One of the primary barriers to inclusive growth is the high cost associated with acquiring mechanized technology; small-scale farmers, entrepreneurs, and businesses in low-income or rural areas may lack the financial resources to invest in expensive machinery or equipment. Additionally, inadequate infrastructure, such as roads, electricity, and internet connectivity, can hinder the adoption and utilization of mechanized technologies, particularly in remote or underserved areas. Without proper infrastructure, businesses and individuals may struggle to access markets, information, and support services. Furthermore, a lack of technical knowledge, training, and skills necessary to operate and maintain mechanized equipment can impede its effective utilization. Access to education and training programs that provide hands-on experience with mechanized technologies is essential for empowering individuals and communities to benefit from mechanization.

Potential Displacement of Labor:

The widespread adoption of mechanization has the potential to lead to job losses in labor-intensive industries and sectors, particularly in agriculture, manufacturing, and transportation. As machines replace human labor, workers may face unemployment or underemployment, exacerbating income inequality and poverty. Additionally, the displacement of labor due to mechanization can disrupt communities and livelihoods, particularly in rural areas where agriculture is a primary source of income. Displaced workers may struggle to find alternative employment opportunities, leading to social dislocation, migration, and urbanization. Even if new job opportunities emerge in mechanized industries, displaced workers may lack the necessary skills or qualifications to transition to these roles. Addressing the skills gap through retraining, vocational education, and lifelong learning programs is essential for facilitating smooth transitions and ensuring social inclusion.

Implications for Social Inclusion:

The unequal distribution of wealth and resources resulting from barriers to inclusive growth can exacerbate income inequality and widen the gap between rich and poor. Mechanization may concentrate wealth and power in the hands of a few, while marginalizing vulnerable populations and exacerbating social disparities. Social exclusion and economic marginalization resulting from these barriers can undermine social cohesion and stability, leading to social unrest, conflict, and political instability. Ensuring that the benefits of mechanization are equitably distributed and shared among all members of society is essential for fostering social inclusion and cohesion. Addressing barriers to inclusive growth and mitigating the negative social consequences of mechanization is crucial for ensuring that all individuals and communities have equal access to opportunities for economic advancement, social mobility, and human development. Promoting inclusive policies, investments, and partnerships that empower marginalized groups and promote social inclusion is essential for building resilient and equitable societies in the face of technological change and globalization.

3.3 Policy Innovations for Inclusive Mechanization

Highlighting examples of policy initiatives aimed at promoting inclusive mechanization involves showcasing strategies that address barriers to access and ensure that the benefits of mechanization are distributed equitably (Smith, 2020).

Subsidies for Smallholder Farmers:

Many governments and development organizations offer subsidies or financial assistance programs to smallholder farmers to help them purchase mechanized equipment, such as tractors, irrigation systems, and harvesting machinery. These subsidies reduce the upfront costs of investment in mechanization, making it more accessible to farmers with limited financial resources (Abdulai & Johnson, 2019).

Training Programs for Marginalized Communities:

Training and capacity-building programs are essential for empowering marginalized communities, including women, youth, and indigenous groups, to participate in and benefit from mechanization. These programs provide hands-on training, technical skills development, and knowledge transfer on the operation, maintenance, and repair of mechanized equipment (Rajaram et al., 2020).

Technology Transfer Schemes:

Technology transfer schemes facilitate the dissemination of mechanized technologies and best practices from more advanced or developed regions to less developed areas. These schemes may involve partnerships between governments, private sector companies, research institutions, and civil society organizations to promote

the adoption of appropriate and sustainable mechanization solutions (Baveye et al., 2018).

3.3.1 The Importance of Stakeholder Engagement And Participatory Policymaking In Ensuring Inclusivity:

Stakeholder engagement and participatory policymaking are essential for ensuring that policies and initiatives aimed at promoting inclusive mechanization are responsive to the needs, priorities, and aspirations of all stakeholders, particularly marginalized and vulnerable groups (Lobell et al., 2017).

Stakeholder engagement allows marginalized communities and individuals to participate in decision-making processes, voice their concerns, and contribute their perspectives and knowledge to policymaking (Gupta et al., 2019). Participatory policymaking fosters a sense of ownership and accountability among stakeholders, as they are actively involved in shaping and implementing policies that affect them (Mallory et al., 2019). Stakeholder engagement provides opportunities for capacity building, empowerment, and skill development among marginalized groups, enabling them to actively participate in decision-making processes and advocate for their rights and interests (Rajaram et al., 2020). Additionally, it facilitates dialogue, negotiation, and consensus building among diverse stakeholders with competing interests and priorities (Chen et al., 2020). By actively involving stakeholders in decision-making processes, policymakers can foster collaboration, build consensus, and create policies that are responsive, equitable, and sustainable (Zhu et al., 2021).

3.4 Case Studies of Successful Mechanization Policies with a Focus on Inclusive Development

India

India's National Mission on Agricultural Mechanization (NMAM) has been instrumental in promoting inclusive mechanization in agriculture. Through schemes like the Sub-Mission on Agricultural Mechanization (SMAM), the government provides subsidies and financial assistance to smallholder farmers for the purchase of mechanized equipment (Rajaram et al., 2020). Additionally, India has implemented training programs and capacity-building initiatives targeting marginalized communities, such as women and small-scale farmers, to enhance their skills and knowledge in mechanized farming practices (Abdulai & Johnson, 2019).

Brazil

Brazil's Programa Mais Alimentos (More Food Program) has successfully promoted inclusive mechanization in agriculture by providing subsidized credit and financing options for smallholder farmers to invest in modern agricultural machinery and equipment (Smith, 2020). Furthermore, Brazil has established extension services and technical assistance programs to support small-scale farmers in adopting mechanized farming techniques and practices, thereby enhancing their productivity and livelihoods (Bennett & Teague, 2018).

China

China's Agricultural Mechanization Promotion Law has facilitated the widespread adoption of mechanization in rural areas. This policy includes financial incentives, subsidies, and tax reductions for farmers purchasing agricultural machinery (Liu et al., 2019). The government also invests in infrastructure improvements, such as rural roads and storage facilities, to support mechanized farming. Additionally, China has developed extensive training programs to educate farmers on the use and maintenance of mechanized equipment, promoting more efficient and sustainable agricultural practices (Zhang & Wang, 2018).

Ethiopia

Ethiopia has made significant strides in promoting inclusive agricultural mechanization through its Agricultural Transformation Agency (ATA). The ATA's Mechanization Services Strategy focuses on improving access to mechanized services for smallholder farmers by establishing mechanization service centers and providing affordable rental services for agricultural machinery (Mengistu & Belay, 2019). These centers also offer training and technical support to farmers, ensuring they can effectively use and maintain the equipment. This approach has helped increase agricultural productivity and reduce labor intensity in farming activities.

Vietnam

Vietnam's government has implemented various policies to support the mechanization of its agricultural sector, particularly benefiting small-scale farmers. The Ministry of Agriculture and Rural Development (MARD) provides subsidies and low-interest loans for purchasing agricultural machinery, making it more accessible to smallholder farmers (Nguyen et al., 2018). Vietnam has also established agricultural cooperatives that facilitate shared ownership and use of mechanized equipment, reducing the financial burden on individual farmers. These cooperatives often include training programs to enhance farmers' technical skills and knowledge of mechanized farming practices.

Kenya

Kenya has adopted a comprehensive approach to promoting inclusive mechanization through its Agricultural Mechanization Services (AMS) strategy. The government provides subsidies and financial assistance to smallholder farmers for acquiring mechanized equipment (Mwangi & Kariuki, 2020). Additionally, Kenya has established public-private partnerships to develop and expand mechanization service centers, offering affordable rental services and technical support to farmers. Training programs and extension services are also integral to the AMS strategy, helping farmers adopt and sustain mechanized farming practices effectively.

3.4.1`Analysis of Key Success Factors and Lessons Learned from Case Studies

Policy Framework and Supportive Institutions:

Successful mechanization policies are underpinned by a robust policy framework and supportive institutional structures that prioritize inclusive development goals (Gupta et al., 2019). Clear policy objectives, coordination mechanisms, and adequate funding are essential for effective implementation and monitoring of mechanization initiatives.

Financial Incentives and Subsidies:

Providing financial incentives, subsidies, and credit facilities to smallholder farmers and marginalized communities is critical for overcoming financial barriers to mechanization (Mallory et al., 2019). Access to affordable financing options enables farmers to invest in mechanized equipment and technologies, thereby improving their productivity and income levels.

Capacity Building and Training:

Capacity-building programs and training initiatives play a crucial role in enhancing the skills, knowledge, and technical capabilities of farmers and rural communities (Rajaram et al., 2020). Training programs should be tailored to the specific needs and contexts of target groups, focusing on the operation, maintenance, and repair of mechanized equipment.

Partnerships and Collaboration:

Successful mechanization policies often involve partnerships and collaboration between government agencies, private sector entities, research institutions, and civil society organizations (Baveye et al., 2018). Collaborative efforts enable the pooling of resources, expertise, and innovation to address complex challenges and achieve common goals.

Monitoring and Evaluation:

Regular monitoring and evaluation of mechanization policies are essential for assessing progress, identifying bottlenecks, and refining strategies as needed (Zhu et al., 2021). Performance indicators, data collection mechanisms, and feedback loops should be established to ensure accountability and transparency in policy implementation.

By analyzing these case studies and key success factors, policymakers and stakeholders can draw valuable lessons and insights for designing and implementing inclusive mechanization policies in other contexts. By prioritizing inclusivity, equity, and sustainability, mechanization initiatives can contribute to poverty reduction, food security, and rural development, benefiting communities and economies worldwide.

3.6 Environmental Sustainability

Examining how mechanization policies can be designed to minimize negative environmental impacts requires a holistic approach that integrates regulatory frameworks, incentives, and technological innovations:

Regulatory Frameworks:

Governments can establish and enforce environmental standards and regulations to mitigate the negative environmental impacts associated with mechanization, including limits on emissions, water usage, and chemical inputs, as well as requirements for environmental impact assessments and monitoring (Johnson & Brown, 2019). Additionally, effective land-use planning can help minimize soil degradation and habitat loss resulting from mechanized activities by implementing zoning regulations, protected areas, and land-use restrictions to preserve ecologically sensitive areas and promote sustainable land management practices (Abdulai & Johnson, 2019).

Incentive Mechanisms:

Governments can provide economic incentives, such as subsidies, tax incentives, and grants, to encourage the adoption of sustainable mechanization practices. Financial incentives for investments in environmentally friendly technologies, renewable energy sources, and resource-efficient machinery can help offset the costs of compliance with environmental regulations (Gupta et al., 2019). Additionally, market-based instruments, such as carbon pricing mechanisms and emissions trading schemes, can internalize the environmental costs of mechanization and incentivize the adoption of cleaner and more sustainable technologies. By putting a price on pollution, these instruments create financial incentives

for businesses to reduce their environmental footprint (Lal, 2015).

Technological Innovations:
Precision agriculture technologies, such as GPS-guided tractors, remote sensing, and variable rate technology, enable farmers to optimize resource use and minimize environmental impacts. By precisely targeting inputs like water, fertilizers, and pesticides, precision agriculture reduces waste, improves efficiency, and mitigates soil degradation and water pollution (Chen et al., 2020). Additionally, the adoption of clean energy solutions, such as solar-powered machinery, electric vehicles, and biofuels, can reduce greenhouse gas emissions and dependence on fossil fuels in mechanized operations. Renewable energy technologies offer environmentally friendly alternatives to conventional energy sources, contributing to climate change mitigation and sustainable development (Wang & Zhang, 2017).
Role of Regulatory Frameworks, Incentives, and Technological Innovations in Promoting Sustainable Mechanization Practices:
Regulatory frameworks, incentives, and technological innovations play complementary roles in promoting sustainable mechanization practices:
Regulatory frameworks provide the legal basis for environmental protection and set the standards and requirements for sustainable mechanization. By establishing clear rules and guidelines, regulatory frameworks create a level playing field and ensure accountability among stakeholders (Smith et al., 2018).
Incentive mechanisms complement regulatory approaches by providing financial and economic incentives for businesses to adopt sustainable practices voluntarily. By aligning economic interests with environmental objectives, incentives encourage innovation and investment in cleaner technologies (Mallory et al., 2019).
Technological innovations drive progress towards sustainable mechanization by providing practical solutions and tools for reducing environmental impacts. Advances in technology enable the development of cleaner, more efficient, and environmentally friendly machinery and equipment (Zhu et al., 2021).
By combining regulatory frameworks, incentives, and technological innovations, policymakers can create an enabling environment for sustainable mechanization practices that protect the environment, enhance resource efficiency, and promote long-term sustainability (Baveye et al., 2018). These integrated approaches ensure that mechanization policies address environmental concerns effectively while supporting economic growth and development.

3.7 Policy Recommendations

To promote inclusive sustainable development, policymakers must adopt a holistic approach that balances economic, environmental, and social considerations. Key policy recommendations include:
Economic Incentives and Support: Provide financial support to small-scale farmers and businesses to invest in sustainable mechanization technologies (Gupta et al., 2019).

Sustainable Practices: Promote the adoption of precision agriculture and clean energy solutions to minimize environmental impacts (Chen et al., 2020; Wang & Zhang, 2017).

Inclusive Policies: Develop policies that ensure equitable access to mechanization benefits, including targeted subsidies, training programs, and infrastructure development (Mallory et al., 2019; Rajaram et al., 2020).

4.0 CONCLUSION

The paper provides a comprehensive analysis of the impacts of mechanization on economic growth, efficiency, and productivity across various sectors, while also highlighting its potential environmental consequences. It emphasizes the need to integrate social, economic, and environmental considerations in mechanization policies to achieve inclusive sustainable development.
Mechanization significantly contributes to economic growth, efficiency, and productivity by increasing output, reducing costs, saving time, and driving technological innovation. However, mechanization can also lead to environmental degradation, resource depletion, pollution, habitat destruction, and soil and water quality degradation if not managed sustainably. Inclusive sustainable development requires balancing economic growth with social equity and environmental stewardship, addressing the needs of all segments of society while safeguarding the natural environment.
Integrating social, economic, and environmental considerations in mechanization policies is essential to ensure that development benefits are equitably distributed and environmental impacts are minimized. Policies should prioritize inclusivity, social justice, and community engagement, empowering marginalized groups and promoting their participation in decision-making processes. Environmental sustainability should be a central consideration in mechanization policies, with

measures in place to mitigate negative impacts on natural resources and ecosystems.

Further research is needed to assess the long-term social, economic, and environmental impacts of mechanization and identify best practices for promoting inclusive sustainable development. Policymakers should prioritize the development and implementation of regulatory frameworks, incentives, and support mechanisms to encourage sustainable mechanization practices. Collaboration between governments, businesses, civil society organizations, and research institutions is essential to address the complex challenges associated with mechanization and achieve inclusive sustainable development goals.

In conclusion, the paper underscores the importance of integrating social, economic, and environmental considerations in mechanization policies to achieve inclusive sustainable development. By prioritizing inclusivity, equity, and environmental sustainability, policymakers can harness the benefits of mechanization while mitigating its negative impacts and promoting the well-being of present and future generations.

This topic offers a broad scope for interdisciplinary analysis, incorporating insights from economics, sociology, environmental science, and public policy. It also presents an opportunity to explore innovative approaches to addressing pressing global challenges while advancing the goal of inclusive growth.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to everyone who contributed to this research. Special thanks to the numerous scholars and experts whose works have informed and inspired my study. I am particularly grateful to the individuals and institutions that provided access to essential resources and data. This paper would not have been possible without the invaluable support and encouragement from my family and friends. Finally, I would like to acknowledge my own efforts and dedication in self-sponsoring this research project.

REFERENCE

Abdulai, A., & Johnson, T. G. (2019). Agricultural mechanization and farmer welfare: Evidence from tractor rental services in Ghana. World Development, 122, 23-37.

Abdulai, A., & Johnson, M. (2019). Mechanization in agriculture: Impact on productivity and food security. *Agricultural Economics Review, 40*(2), 45-61.

Baveye, P. C., Berthelin, J., Tessier, D., Lemaire, G., Tran, G., & Linères, M. (2018). Soil compaction: Mechanical stress, microbial impacts and ecological consequences. Soil Biology and Biochemistry, 120, 205-230.

Bennett, R., & Teague, P. (2018). Agricultural mechanization and smallholder farmers in Brazil. *International Journal of Agricultural Sustainability*, *16*(1), 87-103.

Chen, Y., Liu, Y., & Wang, G. (2020). Effects of different tillage methods on soil physical properties and crop yield in dryland farming. Agricultural Water Management, 234, 106088.

Gupta, R. K., Kukal, S. S., & Bawa, S. S. (2019). Conservation tillage: A tool for sustainable agriculture. Soil and Tillage Research, 194, 104297.

Johnson, D. L., & Brown, J. R. (2019). Mechanized agriculture and soil erosion: A global review. Soil Science Society of America Journal, 83(2), 318-327

Lal, R. (2015). Restoring soil quality to mitigate soil degradation. Sustainability, 7(5), 5875-5895.

Lobell, D. B., Baldos, U. L. C., & Hertel, T. W. (2017). Economic and environmental impacts of greenhouse gas mitigation options for the agricultural sector. *Journal of Agricultural Economics*, *68*(3), 604-617. https://doi.org/10.1111/1477-9552.12217

Liu, X., Yu, Z., & Zhang, Y. (2019). Agricultural mechanization promotion in China: Policy review and recommendations. *Journal of Rural Studies*, *68*(3), 144-154.

Mallory, E. B., Russell, B. E., & Ahuja, L. R. (2019). The effect of agricultural management on soil quality: A review of current and emerging tools. Geoderma, 347, 224-236.

Mengistu, A., & Belay, T. (2019). Agricultural mechanization in Ethiopia: Current status and future prospects. *Ethiopian Journal of Agricultural Sciences*, *29*(1), 54-67.

Mwangi, P., & Kariuki, E. (2020). Agricultural mechanization services in Kenya: Enhancing productivity and sustainability. *Kenya Agricultural Research Journal*, *15*(4), 199-210.

Nguyen, T., Tran, L., & Pham, H. (2018). Mechanization and agricultural development in Vietnam. *Asian Journal of Agriculture and Rural Development*, *8*(2), 150-162.

Rajaram, S., Wang, Z., & Zhang, L. (2020). Education and training for sustainable mechanization: Policy approaches. *International Journal of Educational Development*, *72*(3), 102-118.

Rajaram, S., Kumar, S., Sharma, S., Singh, A. K., & Singh, R. K. (2020). Agricultural mechanization: Opportunities and challenges for sustainable development. Current Science, 118(6), 854-859.

Smith, A. B., Jones, C. D., & Lee, J. W. (2018). Impacts of mechanized farming on soil health: A review. Journal of Soil and Water Conservation, 73(5), 123-135.

Smith, T. (2020). Mechanization and its impacts on economic growth: A review of literature. *Economic Development Quarterly*, *34*(1), 23-41.

Wang, Q., & Zhang, J. (2017). Effects of different irrigation methods on soil water and salt distribution and cotton yield under drip irrigation in Xinjiang, China. Agricultural Water Management, 179, 64-72.

Zhu, J., Li, Z., & Jiang, L. (2021). Effects of organic amendments on soil properties and crop yield: A meta-analysis. Soil and Tillage Research, 207, 104818.

Zhang, L., & Wang, Y. (2018). Sustainable agricultural mechanization in China: Policies and practices. *Sustainable Agriculture Research*, *7*(4), 12-25.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

SUSTAINABLE DEVELOPMENT AND THE ROLE OF MUSIC IN ENVIRONMENTAL, SOCIAL AND ECONOMIC SUSTAINABILITY IN NIGERIA

Julius Oluwayomi OLUWADAMILARE[1] & OlaOluwa Marvelous AYOKUNMI[2]
[1]Department of Music, University of Ilesa, Ilesa, Osun State, Nigeria.
[2]Department of Music, University of Ibadan, Ibadan, Oyo State, Nigeria.
*E-mail: julius_oluwadamilare@unilesa.edu.ng; ayokunmiolaoluwa2016@gmail.com

ABSTRACT
No poverty, Decent work and Economic growth, Sustainable Cities and Communities, Peace, Justice and strong institutions (SDGs 1, 8, 11, &16), among other things, are emphasized by the United Nations Educational, Scientific and Cultural Organization (UNESCO 2016). Since sustainable development focuses on using natural and human resources/environment to enhance human well-being and productivity, the need for a multidisciplinary approach cannot be overemphasized. Therefore, this paper examines the roles of music in enhancing Sustainable Development in Nigeria as reflected in the selected music genres for this study. This paper employs an ethnographic method and Ethnomusicological analysis of the selected songs. The findings of the study revealed that understanding the roles of music in global issues will go a long way in enhancing Sustainable Development in Nigeria. Therefore, this paper concludes that these goals are achievable given the necessary multidisciplinary approaches of which music is one.

Keywords: Sustainable Development, Ethnomusicology, Ecomusicology, Music Business, Popular Music.

1.0 INTRODUCTION
In the last 30 years, the cultural and creative industries have become a major component of the world's economy. Music, as a unique form of art, has played a critical role in promoting sustainable development. Therefore, with the unparalleled influence of music on people, this paper explores the great contribution made by music to the promotion of social, economic, and ecological balance across the globe, including supporting cultural and environmental sustainability, advocating music moderating and guiding human behavior changes towards sustainable consumption and lifestyles, and creating commercial values, employment, and economic growth and industry development.

Sustainable development is a social, economic, and ecological balance and should meet the needs of the current generation without compromising the ability of future generations to meet their needs. In 2015, the United Nations General Assembly passed the 2030 Agenda for Sustainable Development, which incorporated 17 Sustainable Development Goals (SDGs) setting up corresponding indicators. These goals are integrated and indivisible and balance the social, economic, and ecological development aspects, so as to achieve a more sustainable future. Sustainable development is a long-term development concept. Both the long-term evolution and the short-term measures are fundamental. Music, as a unique and beautiful vehicle, can enhance public awareness about sustainable development concepts. Therefore, with the unparalleled influence of music on people, this paper aims to explore the great contribution made by music to promoting social, economic, and ecological balance across the globe.

The most often quoted definition of Sustainable Development comes from the UN World Commission on Environment and Development which defines sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The theory of environmental sustainability is the concept of preserving natural resources for future generations while meeting the needs of the present. It involves activities such as water treatment, waste reduction, pollution control, and resource conservation through renewable methods. Environmental sustainability is a global issue that requires collaboration between various parties, including businesses, individuals, and governments.

It is based on the idea of conducting business activities with minimal harm to the environment and preserving environmental assets for the future. The theory emphasizes the importance of integrated multi-disciplinary knowledge and decision-making for sustained economic growth. It also highlights the need for a shift from unlimited growth and consumption to monitored usage and savings without compromising on growth. The theory recognizes the significance of respecting nature, protecting natural resources, and using

them reasonably as the basis for achieving environmental sustainability.

The paper discusses the theory of environmental sustainability based on the Skolt Sami conceptions of nature obligations, which include reasonableness in resource use, protection of nature, and respect for nature. Environmental sustainability (ES) requires conducting business activities by causing the least harm to the environment. Care and caution must be exercised to see that natural resources are not depleted and that environmental assets are preserved for posterity. ES is a precondition for sustained economic growth, requiring integrated multi-disciplinary knowledge and decision-making. It is based on the idea of conducting business activities with minimal harm to the environment and preserving environmental assets for the future. The theory emphasizes the importance of integrated multi-disciplinary knowledge and decision-making for sustained economic growth. This paper discusses the importance of environmental sustainability and identifies antecedents such as environmental attitude, new environmental paradigm, and pro-environmental behavior.

The main objective of this study is to examine the relevance of Music in Sustainable Development in Nigeria. Specifically, the objectives of the study are to:

(a.) examine the concept of Sustainable Development Goals as it relates to music;

(b.) assess the relevance of music in environmental sustainability;

(c.) evaluate the role of music in social sustainability; and

(d.) assess the viability of music business in economic sustainability in Nigeria.

Research Questions

(a.) How relevant is music in achieving sustainable development goals?

(b.) What is the relevance of music in environmental sustainability? What role does music play in sustaining the environment?

(c.) What is the role of music in enhancing social sustainability as it relates to peace, justice and strong institutions?

(d.) How viable is the input of the music business in achieving economic sustainability in Nigeria?

For decades, Nigeria has been grappling with instability in multiple aspects of life, such as environmental, social, and economic challenges. In the face of these pervasive difficulties, it is imperative to develop sustainable solutions. Social orientation and awareness play a vital role in ensuring the sustainability of a society, even when it comes to generating innovative ideas. This underscores the importance of utilizing music as a means to foster social orientation and awareness, as well as to create employment opportunities. Furthermore, music has the ability to effectively communicate and engage with our surroundings, making it a powerful tool for promoting positive change and fostering a sense of community.

2.0 METHODOLOGY

The ethnographic method used in this research involved in-depth interviews with two notable and successful musicians in Nigeria. These musicians were chosen based on their significant contributions to the Nigerian music industry and their impact on society. The interviews gathered valuable insights into their experiences, perspectives, and motivations regarding their music and its role in the development of the nation. Additionally, the text of two songs from the Nigerian popular music repertoire were thoroughly analyzed. This analysis focused on understanding how these songs, with their lyrical content and musical elements, contribute to the environmental, social, and economic sustainability in Nigeria. By employing the ethnographic method and examining both the musicians' interviews and the songs' text, this research gained a comprehensive understanding of the relationship between music and sustainable development in Nigeria.

Environmental sustainability seeks to maintain the quality of the environment, which plays an important role in enabling good environment for economic activities, which also leads to quality of life for the people occupying the environment. With reference to Sustainable Development Goal (No.11): Sustainable Cities and Communities, the aim of this goal is to “make cities and human settlements inclusive, safe, resilient and sustainable”.

Clark and Button (2011) in Edvin Østergaard (2019) maintain that art is essential when it comes to promoting “critical inquiry of environmental awareness and sustainability” (p. 42). Pillar Nonprofit Network states it clear that music is an art and it is very crucial in creating environmental awareness and sustainability.

The power of music in getting this done can never be overemphasized in any human society. Music, often considered a universal language that transcends borders, has the remarkable power to inspire, unite, and bring about positive change. Igniting individual action is a necessary condition but it is not sufficient. In the quest for sustainable development, a holistic approach is essential, addressing not only economic and environmental factors but also the cultural and social aspects of human well-being. Laws, regulations, physical and social infrastructures are some of the systems that

can be altered to create more favourable conditions for change.

Social sustainability aims to guarantee equality and human rights, respect for the diversity of human cultures, religion and race, as well as preservation of cultural identity. With reference to Sustainable Development Goals (No. 16): Peace, Justice and strong institutions, the goal is to "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels".

Over the years several songs were used to create awareness in the society on the need for freedom, equity, fairness and justice. In countries where adherence to the content and context of such songs were allowed, citizens of such nations have had cause to celebrate freedom, peace and progress.

Economic sustainability seeks to maintain the natural, social and human capital required for income and living standards. With reference to Sustainable Development Goals (No. 1 & 8): No poverty, Decent work and Economic growth, the goal is to "End poverty in all forms everywhere; Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all". The primary goal is to eradicate poverty in all its manifestations worldwide, ensuring that no individual or community suffers from the pervasive effects of financial deprivation. This includes addressing issues such as lack of access to basic necessities, inadequate infrastructure, and limited opportunities for economic advancement.

Additionally, the emphasis is on fostering a supportive environment that promotes lasting and equitable economic progress, creating avenues for inclusive growth that benefit all members of society. By focusing on cultivating sustainable economic initiatives and promoting full employment opportunities, the objective is to establish a solid foundation for resilient and stable development. The ultimate aim is to create a future where every individual has access to dignified work, enabling them to contribute meaningfully to their communities and secure a prosperous future for themselves and future generations.

Findings and Discussion

The findings of this study reveal the multifaceted relevance of music in Sustainable Development as reflected in the subheadings listed below.

1. Music and sustainability

Music and sustainability are closely linked in several ways. Here are some examples:

(a) Environmental impact of music festivals: Large-scale music festivals, often drawing massive crowds and featuring multiple stages and attractions, have the potential to exert a substantial environmental footprint as a result of high energy demands, copious waste production, and emissions from transportation infrastructure. For instance, the substantial electricity consumption required to power extensive lighting and sound systems, as well as the numerous vendors showcasing their products and services. Additionally, the vast amount of waste generated by attendees, from food packaging to disposable items, contributes to the festival's overall environmental impact. Not to mention the carbon emissions stemming from the transportation of concertgoers to and from the event grounds, whether by cars, buses, or planes.

Nevertheless, in response to growing concerns about sustainability and climate change, an increasing number of music festivals are embracing eco-conscious initiatives to mitigate their environmental impact. Among these measures are the implementation of renewable energy sources, such as solar panels and wind turbines, to reduce reliance on conventional fossil fuels. Festivals are also implementing strategies to minimize waste generation, such as encouraging the use of reusable containers, promoting composting practices, and partnering with organizations to recycle materials. Furthermore, many event organizers are advocating for eco-friendly modes of transportation, such as carpooling, public transit options, and bicycle parking facilities, to reduce the festival's carbon footprint and alleviate local traffic congestion.

By incorporating these sustainable practices into their operations, music festivals are not only making positive strides towards environmental stewardship but also setting a precedent for other large-scale events to follow suit. In doing so, they are demonstrating that entertainment and conservation can go hand in hand, creating a more environmentally responsible and enjoyable experience for attendees and communities alike.

(b) Sustainable instrument-making: In the ever-evolving world of music and craftsmanship, a growing number of musicians and skilled instrument-makers are actively exploring innovative approaches to create musical instruments that are not only harmonious to the ears but also gentle on the environment. By delving into the realm of sustainable materials and adopting eco-friendly practices, these dedicated individuals are striving to significantly minimize the environmental footprint associated with the production of musical instruments. Within this intricate process, they are meticulously selecting materials that are renewable,

recyclable, or biodegradable, thereby fostering a more sustainable and ethically conscious approach to instrument creation. This conscious shift towards sustainability is not merely a trend but a profound commitment to fostering a greener future for the music industry, where the harmony of melodies intertwines with the harmony of nature.

As this movement gains momentum, it highlights the intersection of artistry and environmental stewardship, showcasing that creativity can flourish in synergy with sustainable practices. Through their pioneering efforts, these musicians and artisans are shaping a new narrative in the realm of instrument crafting, one that celebrates innovation, creativity, and the profound beauty of creating music in harmony with the planet.

(c) Music for environmental awareness: Music, a universal language (universal phenomenon of communicating to people) with the ability to deeply resonate with people's hearts and minds, has played a crucial role in driving awareness on environmental matters and advancing the sustainability movement over the decades. Through the emotive power of their music, countless artists have committed themselves to sparking a sense of urgency and empathy in audiences, encouraging them to take a stand and support various environmental causes. These musicians harness the captivating nature of their art to not only entertain but also educate and raise consciousness regarding the pressing need to protect our planet's fragile ecosystems and natural resources. By channeling their creative expression into messages of environmental stewardship, they effectively bridge the gap between the public and complex sustainability issues, fostering a sense of shared responsibility and collective action. As advocates for a greener future, these artists use their platform to amplify the voices of environmental campaigners and organizations, amplifying the calls for sustainable living and conservation practices.

In a world where environmental concerns are increasingly urgent, music stands as a potent force for mobilizing communities and galvanizing support for positive change. Ultimately, the fusion of music and environmental activism paves the way for a harmonious collaboration between art and advocacy, uniting individuals worldwide in a common goal of safeguarding the planet for future generations.

(d) Sustainable music consumption: The way in which we choose to consume music plays a crucial role in shaping our environmental footprint. The rise in popularity of streaming services has markedly increased the carbon emissions associated with our music consumption habits. This is primarily attributed to the substantial amount of energy demanded by data centers that store and process the vast quantities of music data being streamed, as well as the energy required to transmit this data seamlessly to users worldwide. Consequently, the environmental implications of our music consumption extend far beyond the enjoyment of our favorite tunes and touch upon the broader sustainability challenges faced by the technology industry. As we delve deeper into the digital age, it becomes increasingly imperative to consider the environmental costs of our online activities and strike a balance between technological advancements and ecological preservation. By being mindful of the energy-intensive nature of music streaming services and exploring alternative ways to access music that are more in harmony with the planet, we can collectively work towards a greener future where our love for music harmonizes with our commitment to environmental stewardship.

(e) Music and sustainable communities: Music, with its universal language and ability to evoke emotions and memories, can serve as a powerful tool in fostering connections and creating a sense of belonging within communities. By bringing people together through shared experiences and cultural expressions, music plays a pivotal role in strengthening social ties and promoting unity among diverse groups of individuals. This sense of community, nurtured by music, is crucial for advancing initiatives that aim to uphold sustainability and encourage environmental stewardship.

Through collaborative efforts and collective actions inspired by the harmonious melodies and rhythms of music, communities can work towards creating a more sustainable future for the planet. The collective spirit and sense of purpose instilled by music can mobilize individuals to take environmentally conscious actions and embrace practices that promote the well-being of the Earth. In this way, music not only enriches the cultural fabric of societies but also empowers communities to come together in support of environmental causes and sustainable practices. The shared passion for music can serve as a foundation for fostering a sense of environmental responsibility and motivating communities to engage in efforts that contribute to the preservation of the natural world for present and future generations. Thus, by leveraging the unifying power of music, communities can strengthen their connections, promote sustainable living practices, and actively participate in environmental conservation efforts to protect the planet for years to come.

2. Music and Environment

Also, the connection between music and the environment is fascinating. Here are some ways music intersects with the environment:

(a) Environmental inspiration: Nature has long been a source of inspiration for musicians, from classical composers like Vivaldi to modern artists like Radiohead.
(b) Ecological messages: Many artists use their music to raise awareness about environmental issues, such as climate change, conservation, and sustainability.
(c) Instrument materials: Musical instruments are often made from natural materials like wood, bamboo, and animal products, which can have environmental implications.
(d) Music production's carbon footprint: The music industry has a significant carbon footprint, from recording and production to touring and live performances.
(e) Sonic ecology: The interdisciplinary field of environmental acoustics delves deep into exploring the intricate relationship between sound and the surrounding environment. It seeks to understand how various sounds, both natural and man-made, interact with ecosystems, and how these acoustic elements can influence the overall health and balance of natural environments. One of the key areas of focus within this field is the detrimental effects of noise pollution on ecosystems. Noise pollution, often generated by human activities such as transportation, industrial operations, and urban development, can disrupt the natural soundscape of an environment, affecting the behavior, communication, and overall well-being of its inhabitants. Through research and analysis, environmental acousticians aim to uncover the specific ways in which noise pollution alters ecological dynamics, impacts wildlife habitats, and ultimately threatens biodiversity. By investigating the intricate web of interactions between sound and the environment, this field not only sheds light on the current challenges posed by noise pollution but also offers valuable insights for developing effective mitigation strategies and promoting sound management practices to safeguard the auditory landscapes of our planet.
(f) Music for conservation: Music has proven to be a powerful tool in promoting conservation initiatives by demonstrating its capacity to inspire positive change and raise awareness on pressing environmental issues. Through various means, including benefit concerts that aim to raise funds for conservation projects, the release of eco-themed albums that shed light on sustainability efforts, and partnerships with environmental organizations to amplify their important messages, the music industry has played a vital role in fostering a deeper connection between art and the natural world. These collaborative efforts not only help generate much-needed support for conservation causes but also serve as a bridge to engage a broader audience in meaningful discussions about the urgent need to protect our planet's precious ecosystems. By harnessing the universal language of music, artists and music enthusiasts alike have joined forces to champion these critical environmental causes, harnessing the emotive power of melodies and lyrics to drive real change and create a lasting impact on the world around us. Through such initiatives, the potential for music to serve as a catalyst for positive environmental action continues to grow, demonstrating the profound influence that artistic expression can have in driving forward the global conversation on conservation and sustainability.
(g) Environmental soundscapes: Music, through the clever integration of natural sounds such as field recordings, has the unique ability to transport listeners into immersive sonic landscapes that not only captivate the senses but also foster a deep sense of connection to the environment. By seamlessly blending these organic elements into compositions, musicians are able to evoke the tranquil rustling of leaves, the gentle patter of raindrops, or the melodic chirping of birds, thereby offering listeners a vivid auditory journey through nature's diverse tapestry. Through this harmonious combination, music becomes a powerful tool that not only entertains but also educates, shedding light on the beauty and intricacies of the natural world.
Furthermore, the use of natural sounds in music serves as a compelling way to raise awareness about environmental issues and encourage a greater appreciation for our fragile ecosystems. By incorporating these sounds into their work, composers can create textured sonic experiences that remind audiences of the importance of preserving and protecting the planet's biodiversity. This approach not only adds depth and richness to musical compositions but also serves as a poignant reminder of the interconnectedness between humanity and the environment.
In essence, the incorporation of natural sounds in music transcends mere auditory pleasure, serving as a catalyst for introspection, contemplation, and a renewed sense of environmental stewardship. Through this innovative approach, musicians can craft ethereal soundscapes that not only entertain and inspire but also provoke thought and nurture a deeper connection with the world around us.
(h) Sustainable music practices: In recent years, there has been a noticeable shift in the way that artists and industry professionals approach their work, with a growing emphasis on embracing eco-friendly practices that benefit both the environment and the community. This transformation is evident in the increasing adoption of sustainable alternatives, such as implementing renewable energy sources, actively working to decrease

waste production, and advocating for sustainable touring methods.

By prioritizing these environmentally conscious measures, the music industry is not only reducing its carbon footprint but also setting a positive example for fans and fellow colleagues. This movement towards sustainability reflects a broader recognition of the interconnectedness of art and the environment, highlighting the responsibility that creative individuals and businesses have in ensuring a more sustainable future. As more and more artists and industry professionals join this green revolution, the impact of their combined efforts becomes increasingly significant, inspiring positive change within the industry and beyond. Through their commitment to eco-friendly practices, these leaders are reshaping the cultural landscape, fostering a more sustainable and environmentally conscious approach to creativity and entertainment.

3. Music and Economic Stability

Furthermore, music plays a significant role in economic sustainability in several ways:

(a) Job creation: The music industry generates employment opportunities in various fields, such as performance, production, management, and education.

(b) Local economic growth: Music events, festivals, and concerts can boost local economies through tourism, hospitality, and merchandise sales.

(c) Cultural export: Music is a valuable cultural export, generating revenue and promoting national identity.

(d) Music tourism*:* Fans travel to attend concerts and festivals, supporting local businesses and economies.

(e) Royalties and licensing: Musicians earn income from royalties and licensing fees, contributing to their economic stability.

(f) Music education: Music schools and programs create jobs and stimulate local economies.

(g) Creative industries: Music is a key component of the creative industries, driving innovation and economic growth.

(h) Brand partnerships: Music partnerships with brands can generate revenue and support economic sustainability.

(i) Digital music economy: Streaming services and online platforms have transformed the music economy, creating new revenue streams.

(j) Social entrepreneurship: Music has the remarkable ability to serve as a powerful catalyst for social entrepreneurship, providing a platform for artists and communities to mobilize and collaborate towards effecting positive change in society. By harnessing the emotive and unifying nature of music, artists are able to not only express their creativity but also connect with their audiences on a deeper level, fostering a sense of collective empowerment and purpose. This enables them to tackle pressing social issues and drive meaningful initiatives that aim to address systemic challenges and disparities.

Moreover, the collaborative and communal aspects of music-making allow for the cultivation of networks and partnerships that can amplify the impact of social entrepreneurship efforts, creating a ripple effect that extends far beyond individual endeavors. Through music, artists and communities are able to leverage their talents and resources to spark conversations, inspire action, and ultimately contribute to building more inclusive and sustainable societies. In essence, music becomes a dynamic force that propels positive social transformation, allowing individuals to channel their creativity and passion towards creating a better world for themselves and future generations.

Some Nigerian Popular Musicians

There are a number of well-to-do and celebrated musicians in Nigeria. Here are some of the most successful musicians in Nigeria:

- Burna Boy: A Nigerian rapper, singer, and songwriter who won the Grammy award for the Best World Music Album in 2021.
- Wizkid: A Nigerian singer and songwriter who has collaborated with international artists like Drake, Rihanna, Chris Brown, Akon, Beyonce, and Justin Bieber.
- Davido: A Nigerian-American singer, songwriter, and producer who has collaborated with international acts like Akon, Chris Brown, Nicki Minaj, Nas, Lil Baby, and Young Thug.
- Tiwa Savage: A British Nigerian songwriter, singer, and actress who has signed endorsement deals with big brands like MTN Nigeria, Maggi, Pepsi, and Forte Oil.
- Yemi Alade: A Nigerian Afropop songwriter, singer, activist, and actress who has bagged several endorsements deals with prominent brands like Hollandia Yoghurt, Maybelline, Shell Oil, Luc Bellaire, and Glo Nigeria.
- Olamide: A Nigerian Hip-hop singer and recording artist who has been nominated severally and has won music awards like Multiple Nigeria Entertainment Awards and the headies awards.
- Timaya: A Nigerian singer and songwriter who is known as the sole founder of the South-South Hip-hop group “Dem Mama Soldiers”.
- Phyno: A Nigerian singer, rapper, record producer, and songwriter who is widely known for rapping in his mother tongue which is the “Igbo Language”.

- Adekunle Gold: A Nigerian singer, Graphic designer, and songwriter who released a hit single titled "Sade" in 2014.
- Kiss Daniel: A Nigerian recording artist, entertainer, and performer best known for his hit single titled Woju and his acclaimed hit song "Yeba".

David Adeleke (Davido)
David Adedeji Adeleke, better known as Davido, is a Nigerian singer, songwriter, and record producer. He made his music debut as a member of the music group KB International. Davido rose to fame after releasing "Dami Duro", the second single from his debut studio album Omo Baba Olowo (2012). He signed a record deal with Sony Music and founded the record label Davido Music Worldwide (DMW). Davido released his second studio album A Good Time in November 2019.
Davido released several successful singles in 2013 and 2014, including "Gobe", "Skelewu", "One of a Kind", "Aye", "Tchelete (Goodlife)", "Africa Rising", "Fans Mi", and "The Baddest". Each song was produced by different artists and featured guest artists such as Shizzi, Puffy Tee, and Meek Mill. Davido was supported with two music videos, with the first directed by Sesan and the second by Moe Musa. The song was ranked fifth on Premium Times' list of the top 10 songs of 2013 and featured cameo appearances from Oskido and Uhuru. He signed a record deal with Sony Music Worldwide Records in May 2016, which allows him to release his music on their label. The album was initially scheduled for release in June 2015 but was delayed due to an unnamed corporation's interest in distributing it. He also collaborated with Mi Casa, Lola Rae, Sarkodie, Diamond Platnumz, and Tiwa Savage on a song for DStv's campaign to inspire community-based social investment projects.
Davido won Best African Act at the 2017 MOBO Awards. He released "If" on February 17, 2017, which was certified diamond and won Best Pop Single and Song of the Year. "Fall" was certified platinum and became the longest-charting Nigerian pop song in Billboard history. Davido released "Assurance" on April 30, 2018, which samples Paw Paw's "Biggie Biggie". He sold out the O2 Brixton Academy venue, performing several songs including "Gobe", "Fans Mi", "Skelewu", "If", "Fall", and "Fia".

Damini Ebunoluwa Ogulu (Burna Boy)
Damini Ebunoluwa Ogulu, better known as Burna Boy, is a renowned Nigerian singer, songwriter, and record producer. He burst into the music scene in 2012 with his smash hit "Like to Party," which served as the flagship track on his debut album, "L.I.F.E." Some of his other notable songs include "Tonight" and "Run My Race."
Burna Boy is a Nigerian singer, songwriter, and record producer known for his unique blend of dancehall, reggae, afrobeat, and pop. He burst into the music scene in 2012 with his smash hit, "Like to Party," which served as the flagship track on his debut album. Burna Boy was born in Ahoada, Rivers State, Nigeria, and his educational journey began at Montessori International School for primary education. He studied Media Communications and Culture at Oxford Brookes University from 2009 to 2010. His family includes his father, mother, and two sisters, Nissi and Ronami. He is currently unmarried and has been in a romantic relationship with Stefflon Don, Princess Shyngle, and Jo Pearl. His estimated net worth stands at $17 million due to his flourishing music career, lucrative endorsements, and wise investments.

Textual Discuss
'Ema ma doro mo' is the theme song in a Yoruba Epic movie of Jimoh Aliu titled *Arelu* is used as a thematic material in Ayokunmi Olaoluwa's choral arrangement titled 'Rere lope'

Text	Translation
Ema ma doro mo	Don't be cruel again
Ema se o, iwa ika	Don't do it, cruelty
Ema se o, ika o da	Don't do it, it's not good
Ema se o	Don't do it

This music condemns social ills, such as wickedness, cruelty, mercilessness and all sorts of inhumane attitudes among the people of our society. The tone of the texts sends a strong, firm and caution to stop whatever practices that can be harmful to people around us. This music pinpoints the presence of unfair and cruel society and thereby giving a proper social orientation to desist from such unkind acts. Music with such content has the potency of shaping the perspective of the people of any given society.
Furthermore, in the same vein, Orlando Owo during his days sang 'E se rere'.

Text	Translation
E se rere e, e se rere	Do good, oh, do good
E se rere, ko bale ye wa o	Do good, so that it might be well with us

This popular music also shows the state of a society where is vise is celebrated. The music is then satirical as it condemns social ills and encourages everyone to do well. The voice of the music sends a message of caution

to evil doers in the society to disengage from such acts. It equally establishes the benefit of doing well; "…do well, so that it might be well with us".

3.0 CONCLUSION AND RECOMMENDATIONS

This article delves into the critical importance of environmental sustainability and its underlying factors, encompassing pro-environmental behavior, the emergence of a new ecological paradigm, and individuals' environmental attitudes. The research findings emphasized that Sustainable Development in Nigeria could be significantly enhanced by recognizing the pivotal role that music plays in addressing global challenges. As a result, it is strongly asserted in this paper that achieving these objectives is not only plausible but also quite achievable through the adoption of comprehensive multidisciplinary strategies, with music serving as a key component among these approaches. Expanding on the interconnected relationship between environmental sustainability and various aspects of societal behavior and perception, this study sheds light on the intricate web of influences that can shape and enhance sustainable practices.

By acknowledging the intricate interplay between individual actions and systemic change, the potential transformative power of integrating music into sustainability efforts becomes even more apparent. Thus, the integration of music into the discourse surrounding Sustainable Development in Nigeria is not only a feasible approach but also a strategic one that can leverage the emotive and communicative power of music to foster greater awareness and engagement. Through a holistic and interdisciplinary lens, this paper asserts that harnessing the diverse influences of music can catalyze positive change and propel Nigeria towards a more sustainable future.

REFERENCES

Itkonen, P. (2022). Environmental Sustainability Generated by the Views of the Skolt Sami and Gregory Bateson. *Journal of Ethnology and Folkloristics*, 16(2), 290-307. https://www.jef.ee/index.php/journal/article/view/470

Østergaard, E. (2019). Music and sustainability education – a contradiction?. *Acta Didactica Norge*, *13*(2), Art. 2, 20 sider. https://doi.org/10.5617/adno.6452

Proenvironmental Behaviour as Antecedents of Environmental Sustainability. *International Journal of Energy Economics and Policy* 13 (3), 418-427. Available at http: www.econjournals.com

Sulphey, et al. (2023). New Environmental Paradigm, Environmental Attitude, and

https://www.ghanaweb.com/person/Davido-1661 [accessed 4.25pm 5/8/2024]

https://medium.com/@itodonr/burna-boy-biography-early-life-age-family-career-and-net-worth-dde662c8bb15 4.22pm 5/8/2024

Music and sustainability education – a contradiction? Available from: https://www.researchgate.net/publication/335742986 Music and sustainability education - a contradiction [accessed Aug 05 2024].

https://pillarnonprofit.ca/news/harmonizing-progress-crucial-role-music-achieving-sustainable-development [accessed 2.40am Aug 06 2024].

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

RELIGIOUS VALUES AND ETHNICS AS PRECURSOR FOR SUSTAINABLE DEVELOPMENT FROM ISLAMIC PERSPECTIVE

Isiaka Adewale Lawal & Azeez Jamiu Adebayo
Faculty of Arts, University of Ilesa
isiaka_lawal@unilesa.edu.ng
jamiu_azeez@unilesa.edu.ng

ABSTRACT

Human action is mostly determined and motivated by many factors and values which serve as guides that determine behavior. The role of religious values and ethics in shaping the development trajectory of communities and nations cannot be overemphasized with reference to Sustainable Development Goal (SDG) number ten, eleven and twelve (Reduced inequalities, Sustainable cities and communities and Responsible consumption and production). This paper looked into how nations and communities can harness the positive impacts and potential of religious faiths and values for sustainable development. The paper concludes by stating how policy makers can explore the religious teachings in their strategic outlook in reshaping the nation towards sustainable development.

Keywords: *Faith, Value, Religion, Development, Islam.*

1.0 INTRODUCTION

The pursuit of sustainable development encompassing environmental stewardship, social justice and economic equity has become a pressing global demand as the world confronts complexities of social inequality, cultural diversity and environmental degradation. The environmental challenge we are facing today according to Conceicao (2020) are the results of reckless and environmentally unsustainable development.

Nigeria as a society according to Jega (2008) has been with many immoral acts that have tarnished the image and integrity of the country and hindered sustainable development. Such acts include misappropriation of public funds, neglect of the masses, severe violation of fundamental human rights, social injustice, lack of probity and accountability and moral degradation to mention but a few. The immorality is so pronounced that many people do not feel ashamed to engage in such acts.

Religious traditions with their moral heritage offer a profound source of inspiration and guidance for promoting sustainable development. The relationship between religious values and sustainable development, therefore, recognizes that spiritual wellbeing is closely related to environmental and social wellbeing, which can serve as a framework in decision making, which will inspire transformative change

The fundamental objectives and principles of religion is based on moral values, ethics of discipline and integrity. So, according to the religious value and ethics, the material resources of a nation should be harnessed and distributed as best as possible to serve the common good and national development. Considering the number of ethical codes written by World Organizations such as United Nations Educational Scientific and Cultural Organizational (UNESCO) it could be concluded that attention to ethics and values were often given a premium in the frame of national and international issues and these values always spelt out what can be accepted and what cannot be accepted.

Religious Value and Development

Political gladiators frequently appeal to the tenets of the rule of law, ethics and religious values in their public discourse, seeking to convey a sense of responsibility, integrity, and moral authority, which can help to build credibility and legitimacy in order to garner public trust and support. Religion is a set of beliefs concerning the cause, nature and purpose of the universe, especially when considered as the creation of a super human agency or agencies which usually involve devotional and ritual observance and often contain a moral code governing the conduct of human affairs.

From this definition, religion, from both Christian and Islamic perspectives, is a divine design and guide to prepare man for a healthy and blissful life. From the Islamic perspective, religion is meant to take care and make adequate provision that guarantees bliss, health and happiness, not only in this world but also in the hereafter. When Prophet Adam was created, Allah taught him the

names of all things that would be beneficial for him and what can serve as tools for development

"Yes, but whoever submits himself to Allah and he is a Muhsin (Good doer) totally for Allah's sake, (without any show off or gain, praise or fame) his reward is with Allah, on such shall be no fear nor shall he grieve." Q2;112
This notion, which was packaged for Adam and any other true believer, is repeated in many different verses of the Qur'an, and when Adam was sent down to the earth, Allah says:
"Get down from the paradise (both of you) some will be enemy to others Then if guidance comes from me, whoever follows the guidance will neither suffer nor go astray" Q20;123

So, religious values and ethics have been integral parts of human existence and these had played a profound role in shaping the fabric of society, providing a moral compass for individuals and communities which inspire countless generations to strive for righteousness, compassion and justice.

Social Justice and Sustainable Development
Sustainable Development Goal (SDG) ten (10) is about reducing inequalities and is one of the seventeen (17) SDGs established by the United Nations in 2015 (Barkat 2022). One of the things that threaten social and economic development and people's sense of fulfillment and self-worth is inequalities and social injustice. Reducing the rise of inequalities both within and between countries requires equitable distribution of resources and transformative change in attitude, value and social justice.

Social justice is a multifaceted concept that has been interpreted and defined in various ways by scholars across different disciplines and background with a view to addressing the issue of fairness, equality and human rights leading to a rich landscape of perspectives on social and political issues and often reflect their individual biases and theoretical orientations. The commitment to social justice arises because of the concern for the health and dynamism of the society at large. So, social justice or reducing inequalities is just about what is fair, just, deserved or something one is entitled to or receive. Hence, social justice in Islam signifies social interdependence by all members of the society and is considered one of the most important values of Islam which is widely practiced by the Prophet and the Sahabah which afforded them the opportunity of building a strong and united society.

Social justice is a society in which justice is achieved in every aspect rather than the administration of law. It is a society which affords individuals and groups or countries fair treatment and impartial share for the benefit of the society. Bilal (2019) viewed social justice from two major concepts; one embodying the notions of merit and desert, the other those of need and equality. Islam as a religion that attuned to nature understands that Human beings are born with varying gifts and acknowledges natural disparity in wealth distribution. However, it is against a wide disparities and extreme economic and social inequalities by those in the position of power.

Allah (SWT) says

Do they distribute the mercy of your Lord? It is We who have apportioned among them their livelihood in the life of this world and have raised some of them above others in degrees (of rank) that they may make use of one another for service. But the mercy of your Lord is better than Whatever they accumulate. (Q43;32)

To ensure sustainable economic and social justice, Islam enjoins equitable distribution of wealth, comprehensive social security and protection of the vulnerable by those in position of power.

Allah (SWT) says:

O you who believe, be persistent on standing for justice, witnesses for Allah, even if it be against yourselves or parents and relatives, whether one is rich or poor, Allah is more worthy of both. So follow not personal (inclination) lest you not be just. And if you distort your testimony or refuse to give it, then indeed Allah is ever aware of what you do and aware. (Q11:84-85)

As exemplified in the above quoted verse, Allah warned against any form of injustice and inequalities based on sex, age, race, class, ethnicity, religion or discrimination in any form. One of the most prevalent forms of injustice is corruption, the government's insensitivity to the plight of the people while people in government live in affluence which often leads to uneven distribution of resources and politics of exclusion. This unfortunate practice has become so deeply entrenched in Nigeria and has reached a critical point where it has become an ingrained and widespread phenomenon infecting every facet of life, to the extent that it is now widely accepted and regarded as a norm rather than being regarded as a harmful anomaly. Ojebode (2008) viewed corruption as a cankerworm that has eaten deep into the very fabric of our (Nigeria) socio political and economic

system and has dented the images of Nigerians with its frontier and beyond.

In Islam, corruption is considered a heinous sin and offensive conduct because it is one of the things that influences public officials in their decision making which may end up hurting others unjustly. Ibn Majah, defined corruption in form of bribe as one of the social vices and a major sin because the Prophet said "May the curse of Allah be upon the one who pays the bribe and the one who takes it." Islam as a religion therefore condemned bribery in its entirety and calls for equal distribution of resources and the provision of needed leadership which will provide equality, justice and sustainable development.

'' And to Madyan, We sent their brother, Shuayb, He said, O my people!, worship Allah, you have no other duty than Him. And do not decrease from the measure and the scale. Indeed, I see you in prosperity but I fear for you the punishment of all encompassing deny. And O my people, give full measure and weight in justice and do not deprive the people of their due and do not commit abuse on the earth. Q 11;84-85

Corruption, injustice and unequal distribution of wealth and resources as a result of bad leadership or lack of religious values and ethics are equated to Jarimah (Waging war against a community) because they hinder and endanger the life of many and cause untold hardship, harm and suffering to many which reduces many people to a state of poverty and hinder sustainable development within the country. (Alazzabi, Mustafa & Abdul Latiff 2020)

When discussing social injustice, two concepts are very significant, these are entitlement and accommodation especially as it relates to resources. Entitlement refers to right of access while accommodation relates to the principle of exclusion or inclusion. So, to have a meaningful livelihood where sustainable development is guaranteed, these pivotal areas are very important:

i. Decent job creation
ii. Universal social protection
iii. Education and lifelong learning for all
iv. Protection of worker's rights
v. Gender equality and non-discrimination
vi. Fair globalization
vii. Just transition to greener economies. (Gilbert 2023)

Deliberate denial of any of these leads to social injustice or social exclusion which the International Labor Organization defines as lack of social security employment and safety of human rights.

Islam and Sustainable Cities and Communities

Goal Eleven among the seventeen (17) sustainable development goals is sustainable cities and communities. Some of the objectives of this goal include provision of access to safe, affordable, accessible and sustainable transport system, enhance sustainable human settlement planning and reduce the number of deaths and the number of people affected. So, one of the key features of sustainable cities and communities is the urbanization and improvement of people's life.

According to Islamic tradition and the Quranic teaching, human being and nations are custodians of land holding it in trust for a limited time, whereas the ultimate ownership and sovereignty over the land belong to Allah.

It is He who has managed the earth manageable for you, so walk among its slopes and eats of its provision and to Him is the resurrection. (67:15)

Mankind are therefore regarded as Allah's trustees on the surface of the earth, and they would be asked on what they do with Allah's creature. As Islam discourages concentration of land on one individual and emphasizes that human life should be taken into account when designing the human rights which should be enjoyed and cannot be taken away from them. Simply put, to deprive them of these rights by virtue of their humanity constitute an affront to the natural sense of justice. In addition, one of the rights owned by man freely and not given from society or law but solely because of his dignity as human being is right to decent life and respect of human life.

While stressing the importance of community, the Holy Qur'an encourages us to engage with one another in a spirit of unity and solidarity with a view to promoting culture of togetherness and collective purpose in our shared journey. "And hold firmly the rope of Allah all together and do not be disunited." This verse apart from being a call for unity is a divine guidance on the power of community in sustaining our connection with Allah.

Islamic Concept of Consumption and Production

According to the United Nations Development Goals, one of the things that can sustain the livelihood is to ensure sustainable consumption of resources. Sustainable

consumption of resources refers to the use of resources in a way that meets the present needs without compromising the future. By adopting sustainable consumption practices, we will be able to conserve natural resources, promote social justice and equity and mitigate climate change. It was reported by Anas bn Malik that the Prophet (SAW) would perform ablution with one Mudd (half a litre) and perform ghusl (ritual bath) with one Sa'a (Two and half litres). This shows us that one of the Islamic teachings is to practice moderation in utilizing natural resources as basic as water. In another hadith, it was reported that the Prophet saw one of the Sahabah performing ablution and the Prophet reported "What is this extravagance" Then Sa'd asked, "Is there extravagance with water in ablution? The Prophet said, "Yes even if you were on the banks of the flowing water.

As observed from the above hadith, Islam abhors any form of wastage that could cause damage to the environment, production and sustainable development. Wastage or extravagant which Islam regarded as Israaf has been mentioned in the Qur'an as a sin. Allah (SWT) says:

"And eat and drink and be not extravagant. Surely, He does not love the extravagant (7:31)."
Also, in Quran 6: 14, Allah says:
"Eat of this fruit when it bears fruit, and pay the due of it on the day of its reaping, and do not act extravagantly. Surely, He does not love the extravagant."

There are several narrations from the Prophet where the Prophet encouraged the Muslim Ummah not to be wasteful and recycling is even encouraged by the Prophet in order to improve production and avoid wastages.

Anas bn Malik reported that the prophet said: "There is no single Muslim who cultivates or plants a tree or sow seeds and then a bird or a person or an animal eats from it, but it is regarded as a charitable gift."

While Islam encourages Muslims to be careful in consumption. It encourages production because it is the key of economic activities. There can be no consumption without production. Production in Arabic means Intaaj which can be defined as human effort to explore the natural

resources created by Allah to generate their wealth in a way that has been permitted by Allah.

Islam encourages its followers to seek for sustenance from halaal.

It is He who made the earth tame for you, so walk among its slopes and eats of its provision and to Him is the resurrection. Q67;15
Seek from what God has provided for you the hereafter and do not forget your share on the world. Q 28;77

The Muslims are enjoined to make every effort to produce something or render certain services that would be of benefit to mankind. However, production in Islam is not solely for profit making but should be a form of worships (Ibaadah) and that is why Islam emphasizes ethics in production and one of ethics is making use of materials that are permissible and avoid unlawful things such as cannabis, weed and any other form of drug or forbidden things. While stressing the importance of production, there are number of verses where production is implicitly or explicitly obsessed.

…And we set down iron, wherein is great military might and benefits for the people and so that Allah may make evident those who support Him and His messengers unseen. Indeed, Allah is Powerful and Exalted in Might.Q57'25

The above verse is making reference to the production of artilleries and any other military equipment out of the iron. The first person according to the Qur'an who engaged in turning iron to other things that are useful for mankind was Prophet David. The verses like these are found in the holy Qur'an where Allah made reference to the importance of production out of the resources provided for mankind by Allah (SWT),

Hussain, stated that in Islam, Tawhid is the basis for directing economic system to its original purpose which is the welfare of human life. He then highlighted ways by which this could be achieved as:

- Production of goods and services that are halaal and good.
- Development of good corporate governance to produce healthy business.
- Effective and efficient business feasibility analysis.
- Payment of Zakat, alms, and Infaq both by producers and employees.
- Carrying out various humanitarian services.

A cursory look at the above conditions reveal that the government has a lot to do in creating enabling environment if the goal is to be achieved. Also, the producer or manufacturer should regard their activities firstly as religious and should allow the fear of God, religious ethics

and values to guide them, bearing in mind that they are just Allah's vicegerent on the surface of the earth.

2.0 CONCLUSION

Religious values, ethics and sustainable development are interwoven because they are all targeted towards compassion, justice, empathy and service to humanity. It has been stated that religious values as related to sustainable development transcends culture and religion. In order to create an egalitarian society where justice reigned with development, there is the need to integrate religion values and ethics where every citizen including the leaders will reflect on their share values to give room for a more conscious world which will encourage community and moral guidance for sustainable development.

REFERENCES

Alazzabi, WYE., Mustafa, H., and Abdul Latiff, A.R. (2020). Corruption and Control from the perspective of Islam. *Journal of Crime.* 27(2)

Barkat S.A., & Ruya L. (2022). *The Sustainable Development Goals and Islam.* UNDP Pakistan.

Bilal Ahmad, B. (2019). The Quranic Approach to Development: Spiritual and Social *International Journal of Advanced Multidisciplinary Scientific Research (IJAMSR)* ISSN 2581-4281 2 (1)

Conceicao Pedro. 2020. *The Next Frontier: Human Development and the Anthropocene*. United National Development Programme.

Gilbert, F.H. (2023). *This way to Social Justice*: *ILO's global campaign to promote against inequalities in the World of Work*. www.ilo.org

Muhammad, T.A. & Muhammad, M.A (1995). Interpretation of the meanings of the noble Qur'an in the English language. Darussalam Pub.

Ojebode, P.A. (2008). Corruption and the Nigerian Democratic Governance: A Christian Perspective. In M.A. Folorunsho et al. (Eds.), Religion and Democratic Governance in Nigeria. *Journal of National Association for the Study of Religion and Education NASRED*. ALAMSEK Press Ltd.

Jega, A.M. (2008, March 9) Democratisation in Nigeria: Problems and Prospects, Daily Independent.

https://library.islamweb.net/hadith

Alislammy.org

www.muslim.ng/articles

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

HARNESSING LITERARY POTENTIALS VIA CHILDREN'S LITERATURE FOR A LASTING SUSTAINABLE DEVELOPMENT

Olufemi ABIOLA[1] & Olusogo A. ODEKUNLE[2]
[1]Department of English, Faculty of Arts, University of Ilesa, Ilesa, Osun state.
[2]Department of English, Faculty of Arts, University of Ilesa, Ilesa, Osun state.
olufemi_abiola@unilesa.edu.ng; olusogo_odekunle@unilesa.edu.ng

ABSTRACT
Literature is a work of art written or unwritten that contains information about the culture, history, belief, practice and ways of life of a people. It is the collected creative writing of a nation, people, group or culture. It embraces mainly works of art that express emotions in a peculiar or unique style. Its style, as well as language of expression distinguishes it from other forms of spoken or written works. Literature can promote sustainable development goals by raising awareness, encouraging dialogue, and fostering understanding of key issues. Through literature, the plight of marginalized communities can be highlighted, leading to greater appreciation, understanding and support from policy makers, corporations and general public. By incorporating literature into classrooms, opportunities for discussions and reflection on sustainable development goals are provided, leading to increased awareness and engagement among students. To achieve this, this paper suggests paying attention to the children by exposing them early in life to carefully selected, good quality materials that have very sound moral and civic lessons to teach, to make them become morally upright, honest and patriotic adults who will take over mantle of national leadership in future.

1.0 INTRODUCTION

Children's literature is crucial to the mental, physiological and social development of children as it eliminates their imagination of the world around them. It also serves as an essential tool for a deeper understanding of a culture, and a basis for a better transition from childhood into adulthood. Muleka (2001:13), for instance, opines that ''in the beginning, there was childhood and childhood makes them man or woman. This suggests that, childhood is an important stage of human development. As such, the quality of literature available to children at this stage is very crucial because, children respond to what they read. (1985), pointed out that children project through their behavior what they read, and, through such projections, one determines the kind of image they form out of the story. It is, therefore, plausible to state that children's literature affects the way children come to conceptualize their own gender and that of the opposite sex. Nodelman, (2008) affirms that, ideas which imply and reinforce normative gender attributes and roles exist within literature written for children. Young children are susceptible to these ideas because they are in the process of developing their gender identities: therefore, literature provides some of their early exposure to expectations of how men and women are to behave. Moreover, literature for children appears to have a long-lasting effect because, they are fixed in nature and can be read and reread.

Given their influence, there should be much interest in how literature for children depicts male and female characters, their roles as well as attributes that promote mutual intelligibility and national development.

Unfortunately, male's role and behaviours are taken for granted by many scholars who have examined gender issues in literature for children in Nigeria, with female stereotypical representation largely probed and challenged. Against this background, this study therefore, examines a socially constructed masculine ideal; the mythology of gender dominance within cultural representations of males in selected narratives. The study probes male sensitive issues and determines what portrayals of masculinity need to be challenged, Deconstructed and adopted in order to make more effective interventions against male violence, female oppression, gender stereotypes and bad leadership.

Mythology of Gender dominance: an overview

A socially conducted masculine ideal is a form of masculinity that refers to traits that various cultures ascribe to 'real men' (Connell, 1987). In the words of Connell, it ''embodies the currently accepted answers to the problem of legitimacy of patriarchy, which accentuates the dominant position of men and the subordination of women'' (77). A number of scholars have identified certain traits of masculine ideal. According to Hatty (2000:181):

Dominant masculinity embraces heterosexuality…, aggression, Hierarchy, and competition… the opportunity and capacity to Dominate others. The use of force and violence is viewed as One of the modes of behavior by which hierarchy is perpetrated In the society.

Luyt (2003:13) also identifies independence, emotional control, and being tough as key dimensions of masculine distinctive. According to him, ''the trait of unemotionality does not deny that men struggle with feelings, but, rather, that these struggles are meant to be kept inside'' Beyron (2002:15) argues that masculine distinctives make men repress joy and tenderness, so much that ''the eventual

result of not expressing emotion is not to experience it''. In essence, these definitions suggest that masculine distinctives often reinforce attributes such as physical strength, violence, force, financial ability and success, emotional control the power to dominate and control others (Women and other Men) and virility. Surprisingly, however, not all men show same level of masculine attainment. Connell and Messerschmitt (2005:832) claim that masculine distinctives require that all men position themselves in relation to their inherent trait, even, if they cannot embody them. Similarly, Yue et al (2014:239) posit that ''while it may not be the most common type of masculinity, it sets the standard against which the achievement of other men are judged''

In Nigeria, there are specific attributes of masculine distinctives which are characteristic of the society. According to Uchendu (2007:283), masculine characteristic in Nigeria include:

Superior physical strength, firmness, fearlessness, decisiveness, an abili8ty to protect the weak, to control, to conquer, to take risks, provide leadership, to be assertive, to enjoy a high social status and to display versatility in martial arts… intelligence, bravery, sobriety, unemotionality, and an absence of smiles.

In Nigeria, a man's masculinity is oftentimes measured by most of these attributes, and to the degree to which he exhibits them. Towards the opposite gender, masculine distinctives are also manifested in presumed virility; through marriage to a female partner, and the ability of the man to impregnate the latter. In some Nigerian societies, marrying multiple wives is an evidence of masculinity. However, regardless of the size of his family, if a man is unable to procreate, Maduagwu (2011:15) states that, his degree of masculinity is either extremely low or he s not considered male at all''. Sometimes, virility goes beyond procreation. It extends to a man's ability to produce a male child. This role is so important that sometimes, the ultimate purpose of being seen as a man in Nigeria, is to produce a male child who will elongate the family's name or heritage. All these traits and expectations have fortified the maintenance of male's authority, domination and supremacy over female gender in all spheres of human endeavours in Nigeria. It should be stressed that boys and young men consciously or unconsciously groomed to follow these societal practices. Banks, (2015:12) Opines:

Masculinity is the only way of living for both the young and old men of Nigeria. Fathers drill it into heir sons, and society will reinforce these guidelines to further instill them into every little boy's way of living. It starts young and They receive training to be the best, as they get older.

Uchendu (2007:288-9) also confirms that in Nigeria, boys ''must pass physical tests, endure pain, confront danger, and must separate from their mothers and women. When these tasks are successfully executed, then, the adolescent male has become a man''. However, these socially constructed masculine distinctive can be dangerous for the emotional, physical and psychological development of the male gender. A research, conducted recently in Europe has begun to point out that young men and boys are in crises due to the excessive manifestation of dominant masculinity (Greer; 2004; Kimmell, 2004). Related studies in Nigeria also point out that when males are unable to attain certain level of financial success or meet the socially expected responsibilities, they see themselves as failures (Uchendu, 2007). This often results in frustration, stress and unhappiness, which explain why males engage in risky behaviors (crime and drug use) as a way of proving their 'manhood' to their peers, women and girls, or as an outlet from the stress of their ascribed roles and responsibilities. While stressing the effects of excessive masculinity, Uchendu (2007) states: At present, the crime wave among Nigerian youths, educated and non-educated is very high, with money-related crimes taking the lead. Excluding such an extreme consequence, the obsession with achieving success and financial independence can lead to excessive use of one's body, the end result of which could be sickness or early physical deterioration…male drive for control, especially within the family, creates room for the abuse of the repressed group, which, if in the larger society may hinder in particular women's display of their potentials, thus resulting in some negative national consequences (290)

Therefore, adherence to culturally dominant traits of dominant masculinity, which often urge males to take risk, practice strict emotional control, and cultivate a sense of vulnerability or destructibility even at the risk of their own lives- can adversely affect their self-respect, physical and mental health. This issue, therefore, calls for the need to probe how literature for children in Nigeria expresses these traits through various images.

2.0 STATEMENT OF THE PROBLEM

Scholarly observation has revealed that dominant masculinity, a pervasive form of masculinity that galvanizes male supremacy and violence, female oppression and gender imbalance, is fore grounded in every aspect of the Nigerian society, thereby posing an incalculable threat to national development. Existing studies on masculinity have focused on adult fiction but paid less attention to children's literature. Works on children's literature have also in most cases concentrated on the female gender to the neglect of male gender (Uzegbu,2012: Kamala, 2013; Ohaeto, 2015) Umeh (1997), for example, investigated the stereotypical representation of women in children's literature. Ohaeto (2015) explored the prevalent patriarchal practices in Nigeria, and how they could be curbed via children's literature. However, none of these studies has vehemently examined the dominant portrayal of male characters in children's literature in Nigeria: a situation that has

continued to expand the gap in the understanding of male's behaviors and attitudes. This study is, therefore, an attempt to fill this gap by exploring the portrayals of dominant masculinity in the selected narratives with a view to uncovering the hidden values of male gender that have a potential of bringing about the desired sustainable development.

3.0 METHODOLOGY

Two purposively selected narratives constituted data for this study. The selection was informed by the inclusion of instances of dominant masculinity in the narratives chosen for the study. In addition, the study has equally selected narratives suitable for children within the age bracket 8-12 years. The study believes, this is the age bracket where children are in the process of developing their gender identities.

Using Carl Jung's theory of the collective unconscious, the selected narratives were subjected to descriptive literature analysis, focusing on the images of dominant masculinity via the analysis of the characters.

Images of dominant masculinity in the narratives are analyzed through the male characters whose behaviors are seen as elemental and universal forms of behaviors in the human psyche, and whose effective embodiment in the narratives evokes a deep response from male readers. Four images of dominant masculinity namely boyhood, manhood, absent fatherhood and father-figures will be analyzed from the perspectives of three archetypes identified by Jung: Hero archetype, father archetype and father-figure archetype.

Boyhood, Gender Socialization, Lasting Development and Dominant Masculinity

Attributes of masculinity are not instinctive since male gender does not begin to manifest form birth masculine attributes. In other words, attitudes exhibited by male gender are learned from infancy and all through the process of socialization. As children, boys are expected to be brave, adventurous and strong individuals showing readiness to distance themselves from perceived effeminate attributes such as emotionality, weakness, and crying. As boys become aware of these attitudes, they groom themselves to manifest them until they become adept at displaying them. This image is portrayed in the narratives.

In Chinelo Ifezurike's *chima laughs last(CLL),* the character of chima and other boys demonstrates how children's narratives in Nigeria mirror underlying assumptions about masculinity by portraying the image of brave, strong boys showing the readiness to distance themselves from effeminate attributes. The narrative demonstrates that in order to become men, boys must flee and ultimately establish power over socially constructed feminine attributes. Initially, in the narrative, chima is portrayed as a constant object of bullying in his class, due to his small stature and intelligence. in fact, he is pictured as someone who finds it difficult to embrace the primitive ways of life other boys live in the school. For instance, he has no time for football, fruit hunting and other conventional masculine exercises that other boys engage in. instead, he is always at home helping his parents with daily routines, something which is in direct contrast to other boys n the narrative. This pictures chima as a model of a tender masculinity. However, his friends lose no time in recognizing chima's lack of manliness as they tease him mercilessly. After enduring series of bullying and teasing, chima soon recognizes the need to meet his manly expectations among his peers. Chima's first attempt to illustrate his masculinity occurs when he is invited for a fruit hunting at Mr. Aghamelu's compound by Obinna, one of his friends. During the fruit hunting, chima s afraid because Mr. Aghamelu has decided to buy a dog in order to chased away children. When Obinna perceives chima's nervousness, Obinna asks; ''I hope you're not afraid. Are you?''. To conceal his fear, Chima replies: ''No, No, why should I? I just wanted to know that we have planned to dodge the dog'' (31). The author using the third person narrative, however, reveals Chima's inner fear: Chima was however afraid. He did not like to be bitten by a dog. He Quickly concealed the fact from Obinna. He knew that Obinna would Laugh at him and call him a girl meaning he was a coward (32).

Here, the author constructs gender dichotomy by attributing timidity to the female gender, a negative image that is entrenched in the psyche of many Africans. Chima, already aware of this image, decides to distance himself from such an image. Hence, the narrative helps maintain patriarchal social order by indoctrinating Chima and the male readers into accepting their dominant position. By implication, the readers, especially the boys, are exposed to such stereotypical parameters that both downgrade the female gender and further reinforce male dominance.

Chima's growth and acceptance of his manly expectations are further shown during a fishing expedition at a river side. The author describes the river as '' deep and the children have been warned against going to the middle of the river and other deeps areas of the river'' (66). At the river, Ifeanyi challenges chima to paddle a canoe. Chima grudgingly replies, ''I can. I'm not afraid, you know,'' (69). Having earlier recognized chima's timidity, Ifeanyi teases him, 'liar! You can't'' (69). This statement generates laughter from other boys. In attempt to prove his masculinity, Chima enters one of the canoes and begins to paddle. By making this choice to accept the challenge, chima finally roots himself as the archetype of masculine strength and bravery in the face of danger. He recognizes the need to improve his failing masculinity among his peers, as anything short will result to being regarded as feminine. Soon, the canoe

capsizes, and Chima falls deep into the river, fortunately, a very good swimmer, who was walking along the river, heard their shout and decides to help. Here, Chima may have been saved from drowning, the main message, therefore, is that of overcoming of the unknown and the rewards of being brave in the face of scary situations. The narrative is able to communicate to the readers the idea that as long as man survives, no matter his age, he must continually flee the feminine in order to keep his masculinity intact.

The image of boys as brave is also heightened in Essien Ako's *The adventures of Akpan Akan Uto (*TAAU) Through the character of Akpan. Adventures constitute one of the popular forms of children's literature because they center on interesting account of heroes going on journeys. In such stories, the protagonists encounter dangerous situations; people are rescued from outrageous disasters; villains are defeated and heroes rewarded. Bettelheim (1975), in relation to adventures, suggests that children can learn to master their anxieties and fears through the ''lessons'' embedded in adventures. He submits that in a culture where adults try to shield children from difficult life knowledge, adventures allow them to face their fears, and understand that they can come to terms with them. This means that readers can gain insight into the ups and downs of life, traveling imaginatively with the boy hero, as he faces and overcomes the challenges on his quest. Nevertheless, the stories also bring out h masculinity in the hero as they journey. As accentuated in *TAAU*, The narrative portrays Akpan's bravery and heroism as he battles with his father. Akpan in the narrative is the archetype of the child hero who Jung (1969) who believes is the Mana personality and the defeater of evil dragons. To Jung, the child hero represents the ego and is often engaged in fighting the shadow. This is typified in the narrative as Akpan battles Ete Ekpe, a mysterious lion that Akpan kills ''in a brave fight'' (25). Akpan continues to follow the archetypal pattern of the hero archetype by embarking on a dangerous journey to the land of the spirits to recover a lost gong belonging to Akpan's grandfather. While Akpan has been under the care of her mother, all along, he has to leave her mother to prove his masculinity. Jung (1954) points out that the departure is the first stage of the child hero. It is a stage where the hero is separated from her mother or similar female domain. Loum (2010) buttresses the importance of such separation to the development of boys: When boys distance themselves from the female domain, it Prevents them from acquiring female traits, particularly from Being emotional or morally weak. Second, cutting a boy off From his mother is a way of raising his sexual consciousness. (120)

What Loum's argument suggests is that such distinction makes boys realize the differences between males and females, and serves as a starting point for the initiation to full masculinity. Separated from his mother, Akpan is able to display heroic deeds in the narrative by not only embarking on the daunting task but also defeating spirit wrestlers along the way and returning home with the gong.

Father Figures, Gender Socialization And Dominant Masculinity.

One of the stereotypical images of masculinity in the narratives is the image of the mentoring father-figures. Father-figures in the narratives are presented through the archetypal father-figure. According to Jung (1954), ''the father figure archetypal figure is a strong male leader and an example of who the hero/ warrior will become. Often very hard and stern on the hero/ warrior''.

Generally, archetypal father-figures are other males of importance such as uncles, grandparents, teachers, coaches, friends, and other mentoring figures in a child's life. However, in the narratives, they are played by friends. Central to the role of father-figures in the society, and in the narratives is that of gender socialization and policing required in order to produce the next generation of men who will continue to uphold the patriarchal creed.

The image of the father figure is particularly striking in CLL. The narrative introduces the readers of two of chima's friends who are influential in initiating Chima into manhood. Earlier in the narrative, Chima is portrayed as a clever boy who struggles to cope with boyhood expectations. However, Chima's growth into manhood in the narrative is chiefly facilitated by his friends, mostly Obinna and Ifeanyi. Both characters coach Chima in the ways of boys and impart similar ideas of masculinity on him. They reflect some particular characteristic of the father-figure image through conveying masculine standard for Chima. Through teasing and bullying, they make Chima realize why weakness is a trait associated with female only and why a boy must be brave, strong, and show the readiness to distance himself from effeminate attributes. Early in the narrative, the readers are introduced to Obinna, Chima's first initiator into boyhood. Obinna is Chima's best friend and equally brilliant. To Obinna, being a boy entails taking risks, escaping the feminine space and suppressing inner fear. Unlike, Chima who has no time for football and other conventional boys' activities, Obinna revels in them. Specifically, it is through fruit hunting that Obinna first introduces Chima to the rudiments of hegemonic masculinity. For instance, a good example is when Obinna comes to invite Chima for fruit hunting while he is busy helping his mother peel cassava. Chima feels reluctant at first but Obinna persists and Chima agrees, even against the wish of his sister, thereby representing his first lesson as a boy. Here, Obinna instills in Chima the need to detach himself from the private sphere that is treated as a feminine domain and encourages him to excel in male-dominated activities. Obinna's father figure's role continues at Mr. Aghamelu's compound. At Mr. Aghamelu's compound,

Chima seems nervous but Obinna questions Chima's timidity by asking: ''I hope you're not afraid. Are you?''(31). Here, Obinna is quick to make Chima realize how outrageous it is for a male to express fear. Hence, Chima decides to stay and continue with the plan; an indication of his progress under the tutelage of Obinna.

MANLINESS, GENDER RELATIONS AND POWER

One of the dominant stereotypical images that resonate in the two narratives is the image of men as dominant and insensitive. Here, the study discusses this image from the perspective of the father archetype. Crisp (2010) points out that ''the image representing father archetype are many: god; a god; a giant; a tyrant; executioner; the devil; older man; male leader- figure; the sun; an older male rival; a holy man or priest; a dominating boss; a bull, etc. some of the images emphasized by crisp are evident in many Africa societies. Men are highly respected in Africa and particularly, Nigeria. Their words assume greater prominence. Supported by traditions and customs, the dominating role of the male, with reference to gender relation has often treated women with ignominy. Men make decisions as the head of the family, have a final say on issues affecting the home-front and subsequently expect women to submit at will. This chauvinist archetypal image is apparent in the two narratives, where men are portrayed as dominant and oppressive.

4.0 CONCLUSION

Literature offers a veritable platform for job creation in developing economies such as Nigeria. For instance, the creative writer earns good money to sustain himself from royalties, arising from the sale of his book(s). The literary critic, the teacher of literature at all levels of the educational strata, the publishers as well as the bookshop keepers are all profitably engaged in the employment chain. They are in this way kept off social, economic, and political crimes. In addition, they are able to pay tax to the coffers of government to enhance sustainable, social and economic development.

REFERENCES

Bettelheim, B. 2010. *The uses of enchantment: the meaning and importance of fairy tales.* New York: Vintage.

Beyron, P. 20002. *International system: an introduction to informatics in organizations:* prentice, U.K

Connell, R.W, and Messers Chimidt, J.W 205. Hegemonic masculinity: Rethinking the concept. Gender and society. 19(6): 829-859. Retrieved on 18th march, 2018 from http://dx.doi.org/10.1177/0891243205278639.

Connell, R.W. 1987. *Gender and power: society, the person, and sexual politics. Stanford,* CA: Stanford University Press

Fox, G., and Beriton, M. 1985. Teaching literature from nine to fourteen. UK: Oxford University Press.

Greer, C. (2004). *Crime, media and community: grief and virtual engagement in late modernity.* Retrieved from https://www.sagepub.com

Hatty, S. 2000. *Masculinities, violence and culture.* California: Sage publications

Kimmel, M.S.2004. masculinity as homophobia: fear, shame, and silence in the construction of gender identity in P.D. Rothenberg (Ed) *Race, Class and gender in the united states: an integral study.* New York, NY: Worth. 81-93

Maduagwu, B.C. 2011. *Teachers' awareness and attitude towards positive psychology.* Received from http://keffi.nsuk.edu.ng

Muleka, H.N. 2001. *Language and literacy: features of style in the selected children's storybooks.* Kenya: Royalite Global.

Nodelman P. 2008. *The hidden adult. Defining children's literature.* Canada: JHU Press.

Russell, Luyt. 2003. *Rhetorical representations of masculinities in south Africa: journal of community and applied social psychology.* 13(1).

Uchendu, E. 2007. *Recollections of childhood experiences during the Nigerian.* New Jersey: African World Press.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ANTIMICROBIAL ACTIVITY OF *SECURIDACA LONGIPEDUNCULATA*ROOT BARK FOR SUSTAINABLE HEALTH AGAINST *STREPTOCOCCUS PNEUMONIAE*

Safiya Balarabe[1], BalaSidiAliyu[2],Nafisa Muhammad Abdullahi [3] and Abubakar Aminu.[4]
[1]Department of Integrated Science, Federal College of Education, Kano.
[2]Department of Plant Biology, Bayero University, Kano.
[3]Department of Biology, Sa'adatuRimi University of Education, Kumbotso, Kano.
[4]Nigerian Institute of Trypanosomiasis Research, Kano State Liason Office, Bayero University Kano, Nigeria.
*Corresponding Author- SafiyaBalarabe.Email-safiyabalarabe@gmail.com

ABSTRACT
Securidaca longipedunculata Fresen (Polygalaceae) is a small tree that grows up to 6m high. It has been used in African traditional medicine to treat various classes of ailment including chronic infections. Phytochemical screening, antimicrobial activity and Gas chromatography-mass spectrometry analysis of the methanol and aqueous root bark extracts of S. longipedunculata were carried out. Phytochemical screening of the methanol extract of the root bark identified carbohydrates, monosaccharides, reducing sugars, tannins, cardiac glycosides, glycosides, terpenoids, saponins, flavonoids, and phenols. Antimicrobial assessment of the crude extracts and fractions against Streptococcus pneumoniae showed some activity. Several chemical constituents where identified from the gas chromatography- mass spectrometry (GC-MS) analysis of the n-hexane fraction. Highest peak area (%) was observed in 2,3,5-Trioxabicyclo[2.1.0]pentane,1,4-bis(phenylmethyl)- with peak area 30.46%. fourier transform- infrared (FTIR) spectrum of n-hexane fraction of S. longipedunculata root bark showed seventeen different peaks with kinds of vibrations, intensity, characteristic absorptions and functional groups like alcohols, alkanes, alkenes, aromatics, aldehydes, ketones which indicated several chemical components found in the plant extract that are responsible for the therapeutic activity of the plant.

Keywords: *Fractions, Gas Chromatography-Mass Spectrometry (GC-MS), Phytochemicals, Securidacalongipedunculata, Streptococcus pneumoniae*

1.0 INTRODUCTION

Upper respiratory tract infections (URIs) are the most common fatal illnesses found in outpatients, who show wide range of clinical manifestation from mild and self-limiting to a life threatening disease (Abed and Boivin, 2006). Common cold, which is a part of the upper respiratory tract infections are usually acute infections that are ignored by people. *Streptococcus pneumoniae* (Pneumococcus) is a lancet shaped gram-positive bacterium (Verheul *et al.*,1995) which grow in pairs or short chains. It is carried in the upper respiratory tract by many healthy individuals. It is an important cause of a wide range and serious human diseases, especially community-acquired pneumonia (Weiser *et al*., 2018). In developing countries, the pneumococcus is responsible for most deaths of the elderly and a large number of children under the age of 5 years (O'Brien *et al*., 2009). Its acquisition rates were reported to be 2-6 times higher in children than adults (Mosser*et al.*, 2014).

*Securidacalongipedunculata*Fresen (Polygalaceae) is commonly used in many parts of Africa for the treatment of various diseases (Alafe*et al*., 2014). It is a small tree that grows up to 6m high and occurs in the Northern and other parts of Nigeria (Iwu, 1986). It has been used as an important part of many traditional preparations employed in the management of various infectious diseases inNigeria (Deeniand and Sadiq, 2002; Gbadamosi, 2012) and in other countries. It is used as treatment for a number of ailments that includes; coughs, malaria, stomach problems, fever, headache, arrow poisons, tuberculosis and sexually transmitted diseases (Afful, 2012; Amadu *et al.*, 2017). The roots are used in Zimbabwe for the treatment of venereal diseases, syphilis, pains, fever, epilepsy, pneumonia, tuberculosis (Mustapha, 2013a) and in Nigeria, for constipation, coughs, fever, pneumonia, sexual boost and toothache as well as for abortion (Mustapha, 2013b).

The aqueous extract of the root bark have been reported to posses antimicrobial, analgesic, anti- inflammatory and hypoglycaemic effects (Olaleye*et al*, 1998; Olaleye*et al*, 2002; Ojewole 2008). As reported by Oliver-Bever (1986), Assi and Guinko (1991) and Iwu (1993), the powdered root with seed is used for the treatment of headache and feverish pain as snuff. The root is used as a purgative in small doses and for the treatment of syphilis and gonorrhea in Ghana (Alafe, 2014). The root is also chewed as a stimulant (Okoli*et al.*, 2005).

This plant is rich in essential oils and other phytochemicals. Phytochemical studies of the root and root bark has led to the isolation of various chemical compounds which include beta-D-(3,4-disinapoyl)fructofuranosyl-alpha-D-(6-sinapoyl)glucopyranoside and beta-D-(3-sinapoyl)fructofuranosyl-alpha-D-(6-sinapoyl)glucopyranoside which are sucrose derivatives (De Tommasi*et al.*, 1993), the alkaloids elymoclavine, and

dehydroelymoclavine, an ergoline compound and cinnamonic acid (Wrobel*et al*., 1996). Some of these compounds like the flavonoids exhibited antimicrobial activity (Ajali and Chukwurah, 2004).

Upper respiratory tract infections are the most common fatal illnesses found in many areas around the world. The treatment of URIs has traditionally relied on pharmaceutical interventions, but there is a growing interest in the use of plants and herbal remedies as alternative or complementary therapies. This shift is driven by several factors, including the increase prevalence of URIs, the resistance of microorganisms to the conventional antibiotics and a rising consumer preference for natural products for treatments. Therefore, the study focused on determining the various phytochemicals and the antimicrobial activity of the selected plant.

2.0 MATERIALS AND METHODS

2.1 Extraction and Phytochemical Screening of *Securidaca longipedunculata*

Extraction and phytochemical screening of *Securidaca longipedunculata* root bark was done following standard procedures as described below.

2.1.1 Collection and Identification

Whole plant of *Securidaca longipedunculata* was collected from Changwal forest Kibiya Local Government Area in Kano state, Nigeria. The plant was identified (specimen no. BUKHAN 013) by Baha'uddeen Sa'id Adam of herbarium unit in Plant Biology Department, Bayero University, Kano. The roots nad root barks were the separated from the whole plant.

2.1.2 Extraction and Preparation of Plant Materials

Securidaca longipedunculata root bark was washed thorou ghly under running tap water to remove the dirt and debris. It was then air-dried at room temperature and crushed with mortar and pestle where 200 g of the powdered plant mater ial was weighed and extracted exhaustively with 2000 ml m ethanol and 2000 ml distilled water for two (2) weeks usin g maceration technique. The extracts obtained were concen trated by complete evaporation of the solvent on a water ba th at 45 ^{o}C (Kaware and Ismail, 2021) and transferred into clean sterile airtight containers, weighed and kept in desicc ators until required for use (Vishnoi, 1979; Sofowora, 1993 ; Trease and Evans, 2002).

Percentage yield of the extracts was calculated from the res pective weights of the extracts using the formula; Percenta ge yield = $\frac{\text{mass of extract}}{\text{total mass of sample extracted}}$ X 100%

Other physical parameters such as colour, texture and odou r of the extracts were also recorded.

2.1.3 Phytochemical Tests

Phytochemical screening of both methanol and aqueous ext racts of *Securidacalongipedunculata*root bark was carried o ut based on standard methods described by Trease and Eva ns, (2002) and Yadav and Munin, (2011).

2.2 ANTIMICROBIAL ACTIVITY

2.2.1Micro-Organisms Test

The clinical isolates used for the research were obtained from Microbiology Department of Murtala Muhammad Specialist Hospital, Kano. The organisms were maintained on nutrient agar, slope at 4^{o}C and sub-cultured before use. The organisms studied were those that are clinically important in causing several infections and essential to overcome them through some active therapeutic agents (Parekh and Chanda, 2007).

Culture Media

Mueller Hinton agar media was used for the growth of the clinical isolates.

2.2.2 Standardization of Inoculums

A loopful of each of the confirmed test isolates were picked using a sterile wire loop and emulsified into 10ml of sterile normal saline to match with the 0.5 McFarland Standard for sensitivity test as described by Perez *et al.* (1990) and Kirby (1996).

2.2.3 Preparation of the Test Concentrations for Sensitivity

Various test concentrations of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml were prepared from each of the methanol and aqueous plant extracts using serial doubling dilution method. Stock solutions of each of the extracts were prepared by dissolving two gram (2g) of each extract in separate Bijou bottles containing 4ml of Dimethyl Sulfoxide (DMSO) to give 1000 mg/ml solutions and labeled as the stock solution. The working solutions were prepared from the stock solutions to obtain various concentrations (Esimone*et al.*, 2012) of 500mg/ml, 250mg/ml, 125mg/ml and 62.5mg/ml respectively. For the control, Ciprofloxacin tablet (500mg) was dissolved in 1ml of DMSO to give a concentration of 500mg/ml.

2.2.4 Antibacterial assay

This assay was conducted using agar well diffusion method where the plates were observed for zones of inhibition around the wells after incubation and the diameters of the zones were measured with a transparent ruler in millimeters (Esimone*et al*., 2012; Singh and Tafida, 2013).

These tests were performed in triplicate.

2.2.5 Determination of Minimum Inhibitory Concentration (MIC)

The plant extract that showed significant antimicrobial activity by the well diffusion method were subjected to minimum inhibitory concentration

(MIC) assay by using tube doubling dilution technique with Dimethyl-sulfoxide (DMSO) to arrive at four different concentrations starting from the lowest concentration that indicated activity from the sensitivity test. The lowest concentrations that showed no evidence of growth (turbidity) after the tests were regarded as minimum inhibitory concentrations (MIC), (Baker *et al.*, 1993, Vallekobia*et al.*, 2001).

2.2.6 Determination of Minimum Bactericidal Concentration (MBC)

The minimum bactericidal concentration (MBC) of methanol and aqueous extracts were determined by sub culturing from the test tubes from each of the MIC test tubes that showed no evidence of growth (turbidity). The plates were further incubated at 37°C for 24 hours to determine the minimum bactericidal concentration (MBC). The highest dilutions that yielded no single bacterial colony on the solid media were regarded as the minimum bactericidal concentrations (Baker *et al.*, 1993; Vallekobia*et al.*, 2001).

2.3 Partitioning of methanol extract of *Securidaca longipedunculata* root bark

The crude (methanol) extract of the plants was subjected to fractionation by solubilization in distilled water then succeeding partitioning with n-hexane (Jamil *et al.*, 2012) multiple times for complete separation of n-hexane soluble materials. The remaining extracts were then partitioned with ethyl acetate and n-butanol following the same process leaving just the aqueous portion. All the fractions obtained were collected in beakers and evaporated to dryness (Javaid *et al.*, 2017).

2.4 Bioassay with Fractions of Methanol Extract

The different partitioned fractions obtained were subjected to a second phase of antimicrobial test using the earlier described method. The fractions concentrations used were 200mg/ml, 100mg/ml, 50mg/ml and 25mg/ml. All tests were performed in duplicate. The fraction that showed the best activity on the organisms was selected for further purification using column chromatography.

2.5 Column Chromatographic (CC) Separation of the Plant Fractions.

A glass tube of 60cm high with a width of 3cm was used for the column chromatography. The adsorbent, silica gel (100, 60-120µm) was carefully packed using wet slurry method to about 25cm in the glass tube. The hexane fractions (2.0 g) of *S. longipedunculata* root bark was loaded onto the packed adsorbent and allowed to stabilize for about 3 hours before elution started. The column was eluted with solvents of increasing polarity in the following stepwise gradients (Mudi and Dauda, 2013) using hexane (100%), hexane: ethyl acetate (2:1), hexane: ethyl acetate (1:1), hexane: ethyl acetate (1:2) and ethyl acetate (100%). Volumes of 100ml were collected at a time until elution was completed per fraction and allowed to evaporate to dryness at room temperature. All the eluetes were labeled accordingly and given special codes (ASH, BSH, CSH, DSH and ESH).

2.6 Bioassay with pooled Column Chromatographic (CC) fractions

The different fractions obtained from the CC were subjected to another phase of antimicrobial test using the method described above to determine the effect of the different fractions. The extracts concentrations used were 50mg/ml and 25mg/ml and all tests were performed in duplicate**.**

2.7 Statistical analysis

Data on the mean zone of inhibition produced by the clinical isolates were analyzed using one-way analysis of variance (ANOVA) and presented as mean ± standard error mean (SEM), where significant difference was considered at $p<0.05$.

3.0 RESULTS AND DISCUSSION

The result of this study showed that methanol extract of *S. longipedunculata* root bark had carbohydrates, monosaccharides, reducing sugars, tannins, cardiac glycosides, glycosides, terpenoids, saponins, flavonoids, and phenols, but combined reducing sugars,freeanthraquinones and alkaloids were absent (Table 1). This is in agreement with Junaid *et al.* (2008) who also found that the aqueous extract of root of *S. longipedunculata* have tannins, saponins, cardiac glycosides, steroids, alkaloids and flavonoids; and the methanol extract have tannins, cardiac glycosides and steroids. Similar study carried out by Okoli *et al.* (2005) showed that methanol extract of the root bark of *S. longipedunculata* tested positive for carbohydrates, reducing sugars, glycosides, flavonoids, terpenoids, sterols and saponins. In another study, its phytochemical screening revealed the presence of cardiac glycosides, flavonoids, tannins, saponins and alkaloids (Auwal *et al.*, 2012; Musa *et al.*, 2013). The result of phytochemical screening carried out by Amadu *et al.* (2017) also revealed the presence of bioactive compounds like alkaloids, glycosides, tannin, saponin, flavonoids, phenols and anthraquinone.

Table 1: Phytochemical Constituents of *S. longipedunculata* root bark extracts

Phytochemicals	*S. longipedumculata* Extract	
	Methanol	Aqueous
Carbohydrates	+	+
Monosaccharide	+	+
Reducing sugar	+	+
Combined reducing sugar	-	+
Tannins	+	+
Free anthraquinones	-	+
Cardiac glycosides	+	+
Glycosides	+	+
Terpenoids	+	+
Saponins	+	+
Flavonoids	+	+
Alkaloids	-	+

KEY: + = present - = absent

The antibacterial activity of *Securidaca longipedunculata* root bark extracts against *Streptococcus pneumoniae* as presented in Table 2 showed the highest mean zone of inhibition produced against the organism at 500 mg/ml concentration were 16 mm and 15 mm, and at 62.5 mg/ml concentration were 9 mm and 10 mm for aqueous and methanol extracts respectively. This showed some degree of activity of the extracts on the test organism. The findings of this research disagree with the findings of Amadu *et al.* (2017) who found that the methanol root extract of *S. longipedunculata* had no activity on the same organism at a highest concentration- 120 µg/ml. This could be attributed to the low concentration of the extract used. Similarly, *S. longipedunculata* ethanol extract showed no inhibition activity against *Streptococcus pyogenes* and *Klebsiella pneumonia* even at the highest concentration of 200 mg/ml (Gbadamosi, 2012).

Table 2: Antibacterial Activity of *Securidacalongipedunculata*(Root bark) Extract (mg/ml) against *Streptococcus pneumoniae*

Test organism	Mean zone of inhibition (mm) produced by the various concentrations of extract									
	Methanol extract				Aqueous extract				Positive control	Negative control
	500	250	125	62.5	500	250	125	62.5	200	DMSO
Streptococcus pneumoniae	15	13	11	10	16	14	11	9	52	0

In Table 3, the antibacterial activity of partitioned fractions (mg/ml) of *Securidaca longipedunculata* root bark against *Streptococcus pneumoniae* showed that n-hexane fraction had higher activity (16.00±1.41 mm at 200 mg/ml) against the organism followed by ethyl acetate fraction (12.00±1.41 mm at 200 mg/ml) and the lowest in aqueous fraction (7.50 ±0.71 mm at 200 mg/ml). The aqueous fraction at 25 mg/ml showed no activity as well as all the n-butanol fractions. This result was similar to that reported by Musa *et al.* (2013) where hexane fraction (17 mm and 16 mm at 200 mg/ml) a

nd ethyl acetate fraction (19 mm and 16 mm at 200 mg/ml) had good antimicrobial activity on *Streptococcus pyogenes* and *Klebsiella pneumonia* respectively. Similarly no signifi cant activity was reported for n-Butanol fraction of *S. long ipedunculata* root against *Staphylococcus aureus* and the h exane fraction of *S. longipedunculata* root had no activity on *Eschericia coli, Candida albicans* and *Pseudomonas ae ruginosa* (Ngonda *et al.*, 2012) which is in contrast with th e activity reported in the present work against *S. pneumoni ae*.

Table 3: Effect of *Securidacalongipedunculata* Root bark Fractions and Concentrations on the Growth of the Clinical Isolate.

Plant	Solvent	Concentration (mg/ml)	Zone of Inhibition (mm) *S. pneumonia* Mean±SE
S. longipedunculata	N Butanol	25	0.00±0.00^{f}
		50	0.00±0.00^{f}
		100	0.00±0.00^{f}
		200	0.00±0.00^{f}
	Ethyl acetate	25	7.00±0.00^{e}
		50	9.50±0.71^{cde}
		100	10.50±0.71^{cd}
		200	12.00±1.41^{bc}
	Hexane	25	9.00±1.41^{de}
		50	11.50±2.12^{bcd}
		100	14.00±1.41^{ab}
		200	16.00±1.41^{a}
	Aqueous	25	0.00±0.00^{f}
		50	7.00±0.00^{e}
		100	7.00±0.00^{e}
		200	7.50±0.71^{e}

Table 4: Effect of Hexane Sub-fractions and Concentration of *S. longipedunculata* Root bark on the Clinical Isolate.

NOTE: Means with different superscripts are significantly different ($p<0.05$)

Table 4 presents the effect of hexane sub-fractions and various concentrations of *S. longipedunculata* root bark on *S. pneumoniae*. It was observed that the mean zones of inhibition produced by ASH (17.00±0.00 mm), BSH (15.00±1.41 mm) and DSH (10.50±0.71 mm) at 50mg/ml are statistically different. The zones recorded for DSH (8.00±0.00) at 25mg/ml are statistically different from those of BSH (11.50±2.12), CSH (11.00±1.41) and ESH (11.50±0.71).

The difference could be attributed to the unique properties of each fraction which contributed to the variation in chemical composition influenced by extraction method.

Plant	Fraction	Concentration (mg/ml)	Organism	Zone of Inhibition (mm) Mean±SE
S. longipedunculata	Hexane		*S. pneumoniae*	
CODE-ASH		25		9.00±0.00^{de}
		50		17.00±0.00^{a}
BSH		25		11.50±2.12^{c}
		50		15.00±1.41^{b}
CSH		25		11.00±1.41^{c}
		50		16.50±2.12^{ab}
DSH		25		8.00±0.00^{e}
		50		10.50±0.71^{cd}
ESH		25		11.50±0.71^{c}
		50		17.00±1.41^{a}

Means with different superscripts are significantly different ($p<0.05$)

The results of GC-MS spectrum of N-Hexane fraction (BSH) of *Securidacalongipedunculata* root bark in Table 5 showed the presence of numerous chemical compounds with different percentage area and retention time. This indicates that the selected plant fraction contain various bioactive components of medicinal importance that were responsible for the antimicrobial activity observed in the plant. The results of this study agreed with those of Yin *et al.* (2009), Gomathi *et al.* (2015),Kohoude*et al.*(2016) and Baha'uddeen *et al.*(2017) reported that GCMS analysis of medicinal plants contain active ingredients that are responsible for the therapeutic effect of plants.

Table 5: Phytochemic al Compounds Identified from N-Hexane Fraction (BSH) of*SecuridacaLongipedunculata* Root Bark byGCMS Analysis

Peak	Retention time	% Area	Compound	Molecular weight	Molecular formula
1	3.564	2.90	1,5-Hexadien-3-yne, 2-methyl-	92.14	C_7H_8
2	50.713	9.19	D-Allose	180.06	$C_6H_{12}O_6$
3	51.043	1.47	1-Octyn-3-ol	126.20	$C_8H_{14}O$
4	54.450	2.04	6-Hepten-3-ol	114.19	$C_7H_{14}O$
5	54.780	30.46	2,3,5-Trioxabicyclo[2.1.0]pentane, 1,4-bis(phenylmethyl)-	254.28	$C_{16}H_{14}O_3$
6	56.392	18.40	9-Oxabicyclo[6.1.0]nonane, cis-	126.20	$C_8H_{14}O$
7	56.978	1.93	1-Hexyn-3-ol and 1-Octyn-3-ol	98.14, 126.19	$C_6H_{10}O$, $C_8H_{14}O$
8	57.124	2.42	7-Octenoic acid	142.20	$C_8H_{14}O_2$
9	67.309	1.93	Phthalic acid, monohexyl ester	250.29	$C_{14}H_{18}O_4$
10	86.689	1.59	{[2-Oxooxolan-3-ylidene]amino}thiourea	173.19	$C_5H_7N_3O_2S$

In Figure 1 and Table 6, the Fourier Transformed-Infrared (FTIR) Spectroscopy of *S. longipedunculata* fraction revealed different type of chemical bonds, functional groups and chemical compounds found in the root bark of the plant. A total of seventeen peaks showing several bands shape, types of functional groups, wavelengths, peak shapes and bonds were present in the plant extract, which justified the antibacterial activity of *S. longipedunculata*.

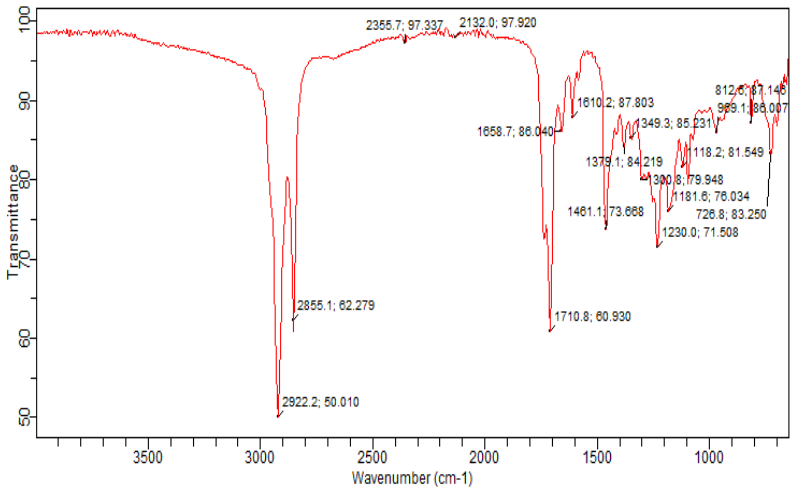


Figure 1: FTIR spectrum of n-hexane fraction (BSH) of *Securidaca longipedunculata* root bark

Table 6: FTIR Analysis of N-Hexane Fraction of *Securidacalongipedunculata* Root Bark.

Peak No.	Wavelength cm^{-1}	Peak shape	Functional Group	Type of Bond
1	2922.2	Very sharp	Alkane	C-H stretch
2	2855.1	Very sharp	Alkane	C-H Stretch
3	2355.7	Narrow	Carbondioxide	O=C=O stretch
4	2132.0	Weak	Alkyne	C≡C stretch
5	1710.8	Very sharp	α, ß –unsaturated aldehydes, ketones	C=O stretch
6	1658.7	Sharp	Alkenes	C=C stretch
7	1610.2	Sharp	α, ß – unsaturated ketone	C=C stretch
8	1461.1	Sharp	Alkane, aromatic rings	C-H bend, C=C stretch
9	1379.1	Sharp	Alkane	C-H bend
10	1349.3	Sharp	Sulfonic acid	S=O stretch
11	1300.8	Broad	Aromatic ester	C-O stretch
12	1230.0	Sharp	Acid	C-O stretch
13	1181.6	Sharp	Ester	C-O stretch
14	1118	Sharp	Alcohol	C-O stretch
15	989.1	Narrow	Alkene	C=C bend
16	812.5	Sharp	Alkyl	C-Cl stretch
17	726.8	Sharp	Alkenes	C-C stretch

4.0 CONCLUSIONS

The findings of this research demonstrated significant antibacterial effects of *Securidaca longipedunculata* against *Streptococcus pneumoniae*, highlighting the potential of medicinal plants as sources of antimicrobial crude drugs and natural compounds for developing new anti-infection agents. This can be achieved through the cultural knowledge of traditional medicine systems which can guide scientific inquiry into plant remedies and ongoing researches to understand the multiple mechanisms of operation of these plant derived drugs as well as investigating and isolating the bioactive compounds to test for their effectiveness to combat antibiotic resistance. Thus, complementing existing antibiotics or serve as standalone therapies.

REFERENCES

Abed, Y and Boivin, G. (2006).Treatment of Respiratory Virus Infections. *Antiviral Research*, (*70)*:2, 1-16.

Afful, E., Owusu, E.O., Obeng-Ofori, D.(2012): Bioactivity of *Securidacalongepedunculata*Fres.against*Callosobruchusmaculatus* Fab. (Coleoptera: Bruchidae) and *Sitophiluszeamais*Motsch (Coleoptera: Curculionidae). *International Journal of Agricultural Science Research1*, 046–054.

Ajali, U. and Chukwurah, B. K.(2004). Antimicrobial Activity of *Securidacalongipedunculata*.*Journal of Phytomedicine*.***11*,**701-703.

Alafe, A.O., Elufioye, T.O., Faborode, O. and Moody, J.O. (2014): Anti-Inflamatory and Analgesic Activities of *Securidacalongepedunculata*Frese (Polygalaceae) Leaf and Stem Bark Methanolic Extract. *African Journal of Biomedical Research. 17*, 187- 191

Amadu, B. A., Yushau, M and Bukar, A (2017): Screening of *Securidacalongipedunculata*Root Extracts for Activity Against Newcastle Disesase Virus and Bacterial Isolates From Upper Respiratory Tract of Human. *Dutse Journal of Pure and Applied Sciences* (*DUJOPAS*).*3*(2);8-19.

Assi, L.A. and Guniko, S. (1991): Plants used in Traditional Medicine in West Africa Hoffman-la Roche Ltd, switerzerland. Page 106

Auwal, S.M., Atiku, M.K., Wudil, A.M. and Sule, M.S. (2012): Phytochemical Composition and Acute Toxicity Evaluation of Aqueous Root Bark Extract of *Securidacalongipedunculata* (Linn) *Bayero Journal of Pure and Applied Sciences* (*Bajopas*) *5*(2): 67 – 72.

Baha'uddeen, S., Abdulkadir, M. M., Abdulrazak, M. H. and Usman, A. (2017).Determination of Phytochemicals and Antimicrobial Activity of Aqueous Stem Bark Extract of *Boswelliadalzielii against* Some Common Pathogenic Microorganisms. *Journal of Microbiology Research* (*UJMR*), *2*(1).

Baker, F. A., Silverton, R. E. and Pallinster, C. J. (1993).*Introduction to Medical Laboratory Technology*: 7; Pp 284-297.

Deeniand, Y.Y. and Sadiq, N.M. (2002): Antimicrobial Properties and Phyto-chemical Constituents of the Leaves of *African mistletoe*

(*Tapinanthusdodoneifolius*(DC) *Danser*) (*Loranthaceae*): An Ethnomedicinal Plant of Hausaland, Northern Nigeria. *Journal of*

Ethnopharmacology. 83(3): 235-240.

Esimone, C. O., Attama, A. A., Mundi, K. S., Ibekwe, N. N. and Chah, K. F. (1012): Antimicrobial Activity of *Psidiumguajava*Linn. Stem Extracts Against Methicillin-Resistant *Staphylococcus aureus. AfricanJournal of Biotechnology*, *11*(89); 15556-15559.

Gbadamosi, I. T. (2012): Evaluation of Antibacterial Activity of Six Ethnobotanicals Used in the Treatment of Infectious Diseases in Nigeria. *International Journal of Botany and Research*, 5 (4): 83-89.

Gomathi, D., Kalaiselvi, M., Ravikumar, G., Devaki, K. and Uma, C. (2015). GC-MS Analysis of Bioactive Compounds from the Whole Plants Ethanolic Extract of *Evolvolusalsinoides*(L.) L. *Journal of Food Science. 52*(2), 1212-1217.

Iwu, M. M. (1986). African Ethnomedicine. CECTA Nig. Ltd., Enugu, 34-37.

Iwu, M.M. (1993): Handbook of African Medicinal Plants CRS press, Boca Raton, Fl, pp 116-118

Jamil, M., Haq, U.I., Mirza, B. and Qayyum, M. (2012): Isolation of Antibacterial Compounds from *Quercusdilatata*L. Through Bioassay GuidedFractionation. *Annals of Clinical Microbiology and Antimicrobials; (11***)**11; 2-5.

Javaid, A., Qudsia, H. and Shoaib, A. (2017): Bioassays Guided Fractionation of *Sennaoccidentalis*for Identification of Natural Antifungal Constituents Against*Macrophominaphaseolina.* PlantaDaninha: *35*

Junaid, S. A., Abubakar, A. Ofodile, A. C., Olabode, A. O., Echeonwu, G. O. N., Okwori, A. E. J and Adetunji, J. A. (2008): Evaluation of *Securidaca longipedunculata* Leaf and Root Extracts for Antimicrobial Activities. *African Journal of Microbial Research*. *2*(12);322-325

Kaware, M. S. and Ismail, M. S. (2021): Antimicrobial Activity of Guava Leaf (*Psidium guajava*) Extracts Against Some Clinical Bacteria Isolates. Dutse Journal of Pure and Applied Sciences (DUJOPAS), 7(2b): 245-252.

Kohoude, M. J., Gbaguidi, F., Agbani, P., Marc-Abel, A. Cazaux, S. and Bouajila, J. (2016):

Chemical Composition and Biological Activities of Extracts and Essential Oil of *Boswelliadalzielii*Leaves. *Journal of Pharmaceutical Biology. 55*(1):33-42.

Mosser, J. F., Grant, L. R., Millar, V. E., Weatherholtz, R. C., Jackson, D. M., Beall, B., O'Brien, K. L. (2014): Nasopharyngeal Carriage and Transmission of *Streptococcus pneumoniae*in America Indian Households after a Decade of Pneumococcal ConjugateVaccine Use. *Journal.pone. 9*(3).

Mudi, S. Y., and Dauda, U. (2013): Screening and Bioassay- Guided Isolation of Antimicrobial Components from *Laggeramollis. Journal of Pure and Applied Sciences* (*Bajopas*), *6*(1): 153

Musa, A.A., Oyewale,A.O., Ndukwe, G. I., Yakubu, S. E. and Abdullahi, M. S. (2013): Phytochemical Screening and Antimicrobial Activity of Solvent Fractions of *Securidacalongepedunculata* (Fresen) Root Bark Methanol Extract**.** *Journal of Chemistry and Pharmaceutical Research. 5*(10):28-33.

Mustapha, A.A., (2013a): Ethno-medico-botanical Uses of *Securidacalongepedunculata* (Fresen)(Family Polygalaceae) from Keffi local government, Nasarawa State, Nigeria. *Journal of NaturalRemedies13*, 133–137.

Mustapha, A.A., (2013b): Ethno-medicinal Field Study of Anti-Fertility Medicinal Plants Used by the Local People in Keffi Local Government, Nasarawa State, Nigeria. *International Journal of Medicinal Plants Research. 2*, 215–218.

Ngonda, F., Magombo, Z., Mpeketula, P. and Mwatseteza, J. (2012): Evaluation of Malawian *Vernoniaglabra*(Steetz) Vatke Leaf and *Securidacalongiprdunculata*(Fresen) Root Extracts for Antimicrobial Activities. *Journal of Applied Pharmaceutical Sciences.2*(11):26-33

O'Brien, K. L., Walfson, L. J., Watt, J. P., Henkel, E., Deloria-Knoll, M., McCall, N., Lee, E., Mulholland, K., Levine, O. S. and Cherian, T. (2009). Burden of Disease Caused by *Streptococcus pneumonia* in Children Younger than 5 Years: Global Estimates.

Okoli, C.O, Akah, P.A and Ezugworie, U (2005): Anti-Inflammatory Activity of Extracts of Root Bark of *Securidacalongipedunculata*Fres (Polygalaceae); *Traditional, African Journal of Complementary and Alternative Medicines.2* (3): 54 - 63

Ojewole JAO (2008): Analgesic, Anti-inflammatory and Hypoglycemic Effects of *Securidacalongepedunculata*(Fresen) (Polygalaceae) Root Bark Aqueous Extract. *Inflammopharmacology16*(4): 171-181.

Olaleye, S.B.; Akinniyi, J.A; Salami, H.A.; Mbajiorgu, F.E and Ameh J.A (1998):Preliminary Study on the Toxicity and Antimicrobial Effects of Extract of *Securidacalongipedunculata*. *African Journal of Biomedical Research.1* (1): 39-44.

Olaleye, S.B.; Onasanwo S.A and Elegbe R.A (2002): Analgesic and anti-inflammatory activities of the root extracts of *Securidacalongipedunculata*(Fres).*Journal of the Society for Experimental Biology of Nigerian*(NISEB).*2* (1): 157 – 164

Oliver-Bever B (1986): Medicinal plants in tropical West Africa. Cambridge University Press, London; pp. 129-130.

Parekh, J. and Chanda, S. (2007):In Vitro Antibacterial Activity of The Crude Methanol Extract Of *WoodfordiaFruticosa*Kurz. Flower (Lythraceae). *Brazilian Journal of Microbiology*.*38*, 204-207.

Perez, C., Paul, M. and Bazerque, P. (1990): An Antibiotic Assay by the Agar-well Diffusion Method. *ActaBiologiaeetMedicinaeExperimentalis,15*, 113-115.

Singh, K. and Tafida, G. M. (2013): Antibacterial Activity of *Moringaoleifera* Leaves Extracts against Some Selected Bacteria. *International Journal of Pharmacy and Pharmaceutical Sciences*, (*6)* 9; 52-54.

Sofowora, A. (1993):*Medicinal Plants and Traditional Medicine in Africa*. 2nd Ed. Sunshine House, Ibadan, Nigeria: Spectrum Books Ltd; Screening Plants for Bioactive Agents; pp. 134–156.

Trease, G.E. and Evans, W.C. (2002): *Pharmacognosy*. 15th Ed. London: Saunders Publishers, pp. 42–393.

Vallekobia, A., Kostalova, D. and Sochorova, R. (2001):Isoquinone Alkaloid from *Ahoniaaquifoliusm*Stem-Bark is Active AgainstMalassezia Species. *Folia Microbiology46*: 107-111.

Verheul, A. F. M..,Verhoef, J. and Snippe, H. (1995):*Streptococcus pneumoniae*: Virulence Factors, Pathogenesis, and Vaccines E. Alonsodevelasco, Pneumococcal Pathogenesis and Vaccines,*Microbiological Reviews*, 59: Pp 591–603

Vishnoi, N.R. (1979):*Advanced Practical Chemistry*. Ghaziabad-India: Yikas Publication House, PVT Ltd.; 1979. pp. 447–449.

Weiser, J. N., Ferreira, D. M. and Paton, J. C. (2018): *Streptococcus pneumonia*: Transmission, colonization and invation. Nature Review. Microbiology. 16(6): 355-367. https://www.ncbi.nlm.nil.gov

Wrobel, J. T, Matuszewska, M, Szychowski, J, Bertazzo, A., traldi P, Costa C. V. and Allegri, G. (1996): Indole Alkaloids and Other Constituents from the Plant *Securidacalongipedunculata*Advances in Experimental Medicine and Biology***398*:** 685-689.

Yadav, R.N.S. and Munin, A. (2011).Phytochemical analysis of some medicinal plants.*Journal of Phytology*, *3*(12): 10-14

Yin, G., Zeng, H., He, M. and Wang, M. (2009): Extraction of *Teucriummanghuaense*and Evaluation of the Bioactivity of its Extract. *International Journal of Molecular Sciences*, *10*(10): 4330-4341

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ANNEXING SOIL RESOURCES IN ONDO STATE FOR ENVIRONMENTAL SUSTAINABILITY

[1]AKINLOYE Kehinde Francis & [2]IRANOLA Olaniyi Michael.
[1]Department of Geography, University of Ilesa , Ilesa, Nigeria
[2]Department of Agricultural Extension and Rural Development, Federal University of Technology Minna, Minna, Nigeria
E-mail: kehide_akinloye@unilesa.edu.ng; iranolaolaniyi@gmail.com 08034658113; 08069783277.

ABSTRACT
Soil is a critical frontier of science and it is important to raise awareness among policy makers, land users, researchers and the general public about the poor state of knowledge on soils and the need to invest in its study. This paper aims to highlight the importance of soil science and geographical knowledge for understanding and managing local environmental conditions; and second, to emphasize the need for comprehensive, locally generated technical data on Nigeria's soil resources. Soil is important to all environmental analysis and is key to addressing global challenges such as climate change, water quality, food security, biodiversity loss, land degradation, famine, and desertification In order to boost agricultural production, proven technologies developed for temperate region soils have been imposed on Nigerian soils indiscriminately, leading to adverse effects on soil health and productivity. To address these issues, developing countries like Nigeria must establish their own soil resource databases and information systems to meet specific local and regional needs, rather than relying on global databases based in advanced countries. Resuscitation and revitalization of the institutions responsible for the management of soil, and soil resources, after elements of the natural resource base is crucial to ensuring sustainable soil use and protecting this fundamental resource for long term use.

Keywords: *Geographical knowledge, Macro environment, Environment, Soil Use, Soil Resources, Region soil*

1.0 INTRODUCTION
Food, shelter, energy, medicine among others are unavoidable and inevitable needs of man. All human beings in particular and living things generally; irrespective of the social, political, geographical or economic system require an uninterrupted supply of natural among other materials to survive. In 1976, a World Conservation Strategy was established with three conservation bodies – the Worldwide Fund for Nature (WWF), the International Union for the Conservation of Nature and National Resource (IUCN) and the United Nation Environment Programme. All with the goal to emphasize the need for the conservation of the world natural resources in order to ensure natural regeneration with their basic needs indefinitely. In essence, this strategy was to establish a framework at the global level through secular and scientific approach. There is therefore the need to venture into the interception point of all the spheres of environment i.e. soil resources this will broaden the scope of environmental sustainability so as to accurately reflect the all – encompassing nature of the earth's environment. This in essence simply means the annexing soil resources to ensure environmental sustainability using a typical soil of Ondo State Southwestern Nigeria as a basis of discussion in this paper and for possible generalization and application to other areas of similar soil and environmental characteristics Soil is a critical frontier of environmental sustainability due to its fundamental role in supporting life on earth by regulating and sustaining all the spheres of environment at local and global level. Soil is the foundation for agriculture through which necessary food for human survival are produced. It is obvious that healthy soil supports crop growth which is essential for feeding the global population. Rapid population growth, increasing frequency of land re–cultivation, greater use of fertilizers and deforestation in south western Nigeria especially in Ondo State, has placed increasing pressure on soil resources due to the need to cultivate more land (Akinoye, 2016). Asifat (2018) revealed that deforestation and cultivation of virgin tropical soil has led to nutrient depletion. Pender and Benin (2012) showed that rapid population has resulted in shortening or eliminating the fallow period widely used in traditional tropical agriculture for nutrient maintenance. Also, Adesina (1989) was of the opinion that over exploitation of land with no input had led to rapid soil degradation and decline crop production. All these provide bases for annexing soil resources and the need for its sustainability in order to ensure food security for ever increasing population.

Soil also is a natural filler, cleaning water as percolated through the ground. This process is vital for maintaining amount of carbon, helping to mitigate climate change healthy soils can sequester carondioxide from the

atmosphere and reducing greenhouse gas levels. Soils are teeming with life including micro – organisms, insects and plant roots. This biodiversity is crucial for ecosystem functions, such as nutrient cycling and organic matter decomposition. Soil plays a key role in the recycling of nutrients, making them available for plant growth. This process is essential for maintaining soil fertility and ecosystem health. Soil also helps to regulate the earth's temperature by storing heat and water. It also influences the atmosphere concentration of greenhouse gases through carbon storage and emission. Several studies has confirmed that healthy soils with robust vegetation cover prevent erosion, which can otherwise led t loss of fertile land and sedimentation in water bodies, harming aquatic ecosystems papka 2001, Odesola 2012 and Gadiga, 2013. Soils ability to retain water helps buffer against droughts and supports plant growth during dry periods, making it critical for water management. Recognizing soil as a critical component of environmental sustainability is essential for developing policies and practices that protect and enhance this vital resource for future generations.

The synergy between soil science and geography and implications for annexing soil resources

The critical role of soil in environmental sustainability underscores the importance of both soil science and geographical knowledge. Integrating these fields can lead to more effective and sustainable management of soil resources, ensuring their health and productivity for the future generations. The intersection of soil science and geographical knowledge highlights the need for a comprehensive understanding of both the physical properties of soils and the human activities that impact them. Collaborative efforts between soil scientists and geographers can lead to improved land management by combining detailed soil science with geographic knowledge to optimize land use practices that enhance soil health while meeting human needs. Understanding local environmental conditions and how they interact with soil properties can help bud resilience to climate change, preventing soil degradation and promoting sustainable practices. In addition, engaging local committees with detailed knowledge of their environment ensures that soil conservation efforts are context – specific and culturally appropriate.

Understanding soil's role in carbon sequestration, water filtration, and nutrient cycling necessitates more detailed and interdisciplinary research. Soil scientist is expected to delve into microbiology, chemistry and physics to develop sustainable land management practices. There is the need to increasingly focus on developing and promoting practices that improve soil health, such as regenerative agriculture, organic farming, and conservation tillage. These practices can help mitigate climate change and ensure long – term agricultural productivity. Advanced techniques in soil science, such as remote sensing and soil health monitoring are crucial for assessing soil conditions find implementing sustainable practices. This includes developing indicators for sol health that can be used by farmers and policy makers. Soils scientists will play a critical role in restoring degraded soils through methods such as phytoremediation, the use of biochar, and the re – introduction of organic matter. This restoration is vital for recycling arid and infertile lands.

Geographic knowledge is essential for understanding the spatial variability of soils and how local conditions affect soil health. This includes understanding climate topography, vegetation and land use pattern. It enables the implementation of site – specific soil management practices. Recognizing that different regions have unique soil characteristics and challenges allows for tailored approaches that are more effective than one – size – fits – all solutions. The sue of Geographic Information System (GIS) and remote sensing in Geography allows for detailed mapping and analysis of soil conditions across large areas. These technologies can track changes in soil health over time and help in planning sustainable land use practices. Geography bridges the gap between human activities and physical landscapes. Understanding how agricultural practices, urban development, and other human activities impact soil health requires a geographical perspective that integrates both physical and human geography. Geography can also help to educate the public and policy makers about the importance of soil health and advocate the importance of soil health and advocate for policies that protect and improve soil resources. This includes boning laws, agricultural subsidies and conservation programs.

Soil studies in Global Databases and Geospatial Technologist

Geographic information system is a geospatial system a feature of the modern age global information science a product of the rise in global databases on different elements of the natural environment, such as, the global soil moisture data bank. This development serves as a great opportunity for developing countries to annex soil data available at the global source for environmental sustainability in their locality. Areola (2015) described Africa's soil as the most important resource for its agrarian economic importance. As a result, soil resources of Africa deserve a great deal of attention more than other resources most especially in terms of data needed for sustainable soil management. On the contrary the overall knowledge of the soil is still scanty, there is a dearth of detailed studies this is evident in the paucity of large-scale maps in Nigeria. Areola (2015) claimed that this

problem is partly historical, for long, soil studies in Africa suffered from sweeping generalizations and myths about the supposedly harsh and inhospitable nature of the African environment and the poverty of its resource-base most especially the soils. According to him, such misconceptions led to an oversimplication of explanations of soil genesis and distribution on the continent in which persists in the present day situation in which natural and sub-regional soil maps are derived from small-scale maps of Africa or of the world rather than the other way round.

Developed countries housed these global databases and already have detailed information and huge data bases on their soil and other natural resources. Linkage with and participation in the global resource databases should help these countries to develop a health respect for quality standards in resource studies this will definitely reflect their own national data bases. Global data bases maintain strict quality standards for acceptance of contributions from different parts of the world. Data base development will definitely lead to standardization of survey and mapping procedures, development of classification schemes and specifications on acceptable analytical procedures, scales and accounts of measurement of individual parameters. The soils need to be studied and evaluated at a regular interval of time and distant both in context and in content. Embarking on the slow and laborious programme of systematic survey and mapping of soils in the field before planning the economic development is not advisable for the less developed countries.

Geospatial technologies of remote sensing and geographical information systems offer exciting possibilities with regards to the analysis of the soil resources. As revealed by Alplin (2004), the plethora of earth resources technology satellite systems with highly enhanced imaging systems now make it possible to analyse earth surface conditions at the micro-level from space. Global Positioning System (GPS) and Geographic Information System (GIS) technologies enable the couping of real-time data collection with accurate position information, leading to the efficient manipulation and analysis of large amounts of geospatial data. Also, remotely sensed multi-spectral images taken from satellies and aircraft can provide farmers with a wide range of information about their fields. In addition, there are many indices, such as vegetation and temperature condition tha have been developed for use in interpreting remotely sensed imagery for a variety of purposes.

Soil Studies and Environmental Sustainability in Ondo State

Ondo State has diverse soil types such as ferrallitic soils of the rainforest region, suitable for cocoa, oil palm and other crops. Hydromorphic soils found in riverine and swampy areas suitable for rice and vegetable cultivation and Red and Yellow soils found in dried regions. This soil is suitable for arable crops like yam and maize. Ondo State is known for its agricultural productivity, most especially in cocoa, oil palm and food crop production.

The potentials of Ondo state soil therefore requires adequate strategies for annexing soil resources in the area this can be achieved through the following:

Soil testing and mapping to understand soil composition, soil pH and nutrient contents

Fertilizer application to enhance soil fertility in accordance to soil test result

Crop rotation and diversification o prevent soil depletion and to promote sustainable farming practices

Development of irrigation systems during season in order to improve crop yields

Research and development to improve crop variables and farming techniques suited to the local soil conditions

There is the need for farmer education and support on best practices for soil management and sustainable agriculture.

Ensuring environmental sustainability by annexing soil resources in Ondo state involves adopting practices that protect and enhance the soil, reduce environmental impact and promote long term agricultural productivity through different sustainable development strategies such as conservation tillage, cover cropping, crop rotation and diversification, agroforestry and organic farming. In addition, terracing and contour ploughing, riparian services enhancement and policy support and incentives are also essential to achieve environmental sustainability in the area By adopting these strategies, Ondo state can ensure the sustainable management of its soil resources leading to improved agricultural productivity environmental health and long term socio – economic benefits.

2.0 CONCLUSION

Soil issues will continue to be critical to the survival of mankind and to the maintenance of sustainable environment. Soils are a frontier of science and it is important to raise awareness among policy makers, yet there is still much that is unknown or partially known about soils. Fortunately there is increasing sophistication in the technology and methodology soil investigation which now makes it visible to observe, measure and model the intricacies of the soil. Finally, Ondo State is identify as a place of a diverse soil types with great agricultural potential adopting sustainable strategies is

therefore recommended to annex soil resources and achieve environmental sustainability in the area.

REFERENCES

Adesina F.A (1991) Plant species characteristics and Vegetation Dynamics in the Tropics. *International journal of Environmental Studies*, 33. pp:67-78.

Akinloye, K.F. (2016). Assessment of Soil Fertility Status and Land Management in selected Farm Settlement of Osun State, south Western Nigeria Unpublished Ph.D. Thesis. *Obafemi Awolowo University, ile-ife.Nigeria.*

Alphin Ral (2003) "Using Remotely sensed data" in key methods in Geography ed. Clifford, Nicholass & Grill, Valentine, London, Sage publication chapter18 pp. 291 – 308.

Areola O, (2015) "Perspectives on Soil Resources and Sustainable Environment Research and Sustainable Environment eds Gbadegesin A.S., Eze B.E., Orimoogunje OO.I and Fashee O.A Pp 167 - 185

Gadiga, B.L (2012) The functioning of shelterbelts in soil and floristic restoration in the sudano-sahelian region of yobe state Nigeria unpublished Ph.D. Thesis, Department of Geography, OAU Ile-Ife.

Odesola M.A (2013) Land Utilization systems and Soil fertility status in Ife – East Local Government Area of Osun state Unpublished M.Sc. Thesis, Obafemi Awolowo University, Ile – Ife.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

TRADITIONAL USES AND PHARMACOLOGICAL POTENTIAL OF MEDICANL PLANTS OF THE ASTERACEAE FAMILY IN NIGERIA: A REVIEW

[1]Attah, C, [2]Ibrahim, S., [2]Ahmadu J. H. and [3]Terhide, T. S.
[1]Department of Chemistry, Federal College of Education
[2]Department of Medical Biotech, National Biotechnology, Abuja
[3]Department of Biological Sciences, Federal University of Kashere Gombe
Corresponding Author: cathyattah@yahoo.com, attahcatherine1@gmail.com

ABSTRACT
The medicinal value of traditional plant-based remedies has been recognized for thousands of years, and as modern medicine evolves, there is a growing need to revisit and explore the potential of these remedies. This review article discusses the traditional uses of Asteraceae plants in Nigeria and their potential pharmacological properties. Various species of Asteraceae plants have and have been used to treat a wide range of health conditions such as; gastrointestinal disorders, skin conditions, respiratory disorders, fever, malaria, and diabetes. These plants contain bioactive compounds such as sesquiterpene lactones, flavonoids, essential oils, polysaccharides, and other bioactive compounds that exhibit a range of pharmacological activities including; anti-cancer, anti-microbial, antioxidant, and immune-modulatory effects. These compounds are thought to act by inhibiting various enzymes involved in inflammation, scavenging free radicals, disrupting the cell membranes of microorganisms, modulating the activity of various immune cells, and inhibiting various enzymes involved in inflammation. Traditional Asteraceae-based treatments have shown therapeutic effects that suggest the potential for drug discovery and development. Further research is required to fully understand the biochemical mechanisms and routes underlying the therapeutic effects of these plants. The review, therefore, contributes to the scientific knowledge of Asteraceae plants and may provide new insights into their potential use in the development of drugs to treat various health conditions.

Keywords: *Asteraceae, Medicinal plants, Nigeria, Pharmacological potential, Traditional use.*

1.0 INTRODUCTION
Studying medicinal plants for drug discovery and development is crucial as many modern medicines are derived from natural compounds found in plants. The use of medicinal plants has a long history dating back thousands of years, and they provide a rich source of bioactive compounds with the potential to be developed into new drugs for various diseases (Newman and Cragg, 2020). Traditional medicines derived from plants have been the basis for the development of numerous drugs such as aspirin, morphine, and quinine (Patel & Patel, 2017).

The Asteraceae family, also known as the Compositae family, is a diverse and significant group of flowering plants, comprising over 23,000 species worldwide (Wang *et al*., 2015). Traditional healers and herbalists have used various species of Asteraceae plants for centuries to treat numerous health conditions, including, digestive disorders, respiratory disorders, and skin conditions (Buwa-Komoren, *et al*., 2019). Some common species in the Asteraceae family include *Chromolaena odorata* (Siam weed), which is predominantly found in the southwestern regions, especially around Ile-Ife in Osun State; *Vernonia amygdalina* (Bitter leaf), which is commonly cultivated and found in gardens and farms throughout Nigeria; *Ageratum conyzoides* (Billygoat-weed), which is frequently found in the southwestern regions, particularly in Osun State; and *Aspilia africana* (Wild sunflower), which is predominantly found in the southwestern and southeastern regions (Chukwuma, *et al*., 2020; Chukwuma, 2023; Cole, *et al*., 2024).

This review aims to explore the traditional uses and pharmacological potential of Asteraceae plants, with a focus on their biochemical roles. The review will examine the various phytochemicals found in Asteraceae plants and their potential pharmacological activities, including their mechanisms of action. In addition, the review will discuss safety and toxicity considerations.

2.0 METHODOLOGY
A systematic review of the literature was conducted using databases such as PubMed, ScienceDirect, and Google Scholar. Keywords used in the search included "Asteraceae," "traditional medicine," "Nigeria,"

"medicinal plants," "phytochemicals", and "pharmacological potential". Only articles published in English and peer-reviewed were included.

3.0 DISCUSSION

PHYTOCHEMICAL AND PHARMACOLOGICAL POTENTIAL

Asteraceae plants are known to contain a wide variety of bioactive compounds, including sesquiterpene lactones, flavonoids, essential oils, and polysaccharides, among others. These compounds have been reported to have a range of pharmacological activities and mechanisms of action, making them highly suitable for drug discovery and development.

Sesquiterpene lactones, one of the most well-known classes of compounds found in Asteraceae plants, have been shown to exhibit a wide range of pharmacological activities, including anti-inflammatory, anti-cancer, and anti-microbial effects (Koul, *et al*., 2017; Mandal, *et al.*,2020; Matos, *et al.*,2021; Kumar,& Pundir, 2022). These compounds are thought to act by inhibiting various enzymes involved in inflammation, such as cyclooxygenase and lipoxygenase, as well as by scavenging free radicals (Saha & Paul, 2019; Duran, *et al*., 2021; Anyiam, *et al*.,2023)

Flavonoids are another important class of compounds found in Asteraceae plants. These compounds are known to exhibit a wide range of pharmacological activities, including anti-inflammatory, antioxidant, and anti-cancer effects (Dias, *et al*., 2021, (Ojo, *et. al.*,2022; Suja, *et al.*,2024). They are thought to act by inhibiting various enzymes involved in inflammation, such as cyclooxygenase and lipoxygenase, as well as by scavenging free radicals (Ogbu, *et al*., 2020; Khanal, *et al*.,2021)

Essential oils, which are complex mixtures of volatile compounds found in many Asteraceae plants, exhibit a range of pharmacological activities such as antimicrobial, anti-inflammatory, and antioxidant effects. Research shows these compounds can disrupt the cell membranes of microorganisms and scavenge free radicals (Carvalho, *et al.*, 2016; Koul, *et al.*, 2017, Nwozo, *et al.*,2023).

Polysaccharides, which are complex carbohydrates found in many Asteraceae plants, exert a range of pharmacological activities including immune-modulatory, anti-inflammatory, and anti-cancer effects, as demonstrated in studies (Di Sotto, *et al*,2020; Ngwuluka, *et al.*,2021). Research reveals these compounds mediate their effects by modulating the activity of various immune cells, as well as inhibiting enzymes involved in inflammation (Prasathkumar, *et al*, 2021).

Other bioactive compounds found in Asteraceae plants, such as terpenoids and phenolic acids, demonstrate a variety of pharmacological activities in studies, including anti-inflammatory, anti-microbial, and antioxidant effects. Studies indicate these compounds exert properties like combating inflammation, fighting microbes, and reducing oxidative stress (Xuan & Khanh, 2016; Koul, 2017,Ojo, *et al*., 2022).

The medicinal importance of selected indigenous medicinal plants of Asteraceae family in Nigeria is summarized in the Table 1 below:

Table 1: Pharmacological potentials and traditional uses of medicinal plants of Asteraceae family

Botanical Name	Common Name	Part Used	Phytochemical Constituents	Pharmacological Potentials	Traditional Uses	References
Vernonia amygdalina	Bitter leaf	Leaves	Sesquiterpene lactones, Flavonoids, Alkaloids	Antioxidant, anti-inflammatory, and antimicrobial properties	Treatment of malaria, diabetes, and gastrointestinal disorders	Kadiri & Olawoye (2016).
Eupatorium odoratum	Scent leaf	Leaves	Flavonoids, Alkaloids, Essential oils	Antimicrobial, anti-inflammatory, and analgesic properties	Treatment of malaria, cough, and digestive disorders	Omokhua, *et al.* (2016)
Helianthus annuus	Sunflower	Leaves	phenols, flavonoids, tannins, alkaloids, saponins, and fatty acids	Antimicrobial, anti-inflammatory, and analgesic properties	Anti-inflammatory, Antioxidant, Antimicrobial properties, Wound healing	Stephen & Folusho. (2016); Adeleke & Babalola (2020).
Chromolaenaodorata	Siam weed	Leaves	Sesquiterpenes, flavonoids, phenols, and triterpenes	Anti-inflammatory activity, anti-microbial activity, Antioxidant activity, Analgesic activity	Malaria, Wounds, Skin infections, Anti-inflammatory, Respiratory infections	Sirinthipaporn & Jiraungkoorskul (2017).
Tithonia diversifolia	Tree marigold	Leaves	Sesquiterpene lactones, flavonoids, and steroids	Antimicrobial, Anti-inflammatory, Antioxidant, and Wound healing	Treatment of skin diseases, fever, and respiratory tract infections	Ajao & Moteetee, (2017); Alhassan, *et al.* (2017).
Elephantopus scaber	Elephant's foot	Leaves	Flavonoids, terpenoids, and steroids	Anti-inflammatory, Antimicrobial, Anti-diabetic	Treatment of fever, malaria, and respiratory problems	Mandal, *et al.* (2018).

TRADITIONAL USES OF ASTERACEAE PLANTS IN NIGERIA AND OTHER AFRICAN COUNTRIES

The Asteraceae family is renowned for its extensive traditional medicinal applications in Nigeria and across other African countries. Various species within this family are valued not only for their anti-inflammatory properties but also for their role in treating a wide range of health conditions, such as gastrointestinal disorders, skin ailments, respiratory issues, and other traditional uses. Beyond Nigeria, the medicinal uses of these plants are recognized in countries like Ghana, Kenya, and South Africa, where they serve as important remedies in local healthcare practices.

PHARMACOLOGICAL ACTIVITIES OF ASTERACEAE PLANTS:

Inflammations and Biochemical Mechanisms:

Inflammation is a natural response to injury or infection, but when uncontrolled, it can lead to chronic conditions like cancer, arthritis, and diabetes (Tasneem *et al*., 2019). In Nigeria, Asteraceae plants are traditionally employed to manage inflammation. Phytochemicals such as sesquiterpene lactones, flavonoids, and polysaccharides

in these plants have been shown to inhibit the production of inflammatory cytokines and enzymes, thereby offering potential therapeutic benefits (Rolnik & Olas, 2021). In Kenya, these plants are also used to alleviate inflammatory conditions, highlighting their widespread importance in African traditional medicine (Mailu, 2021; Mokua,2021; Adeleye, *et al.*,2021).

Gastrointestinal Disorders and Biochemical Mechanisms:

Gastrointestinal issues like diarrhea and dysentery are prevalent health challenges in Nigeria. *Vernonia amygdalina* (bitter leaf) is one such Asteraceae plant traditionally used to treat these disorders. The alkaloids, flavonoids, and terpenoids in bitter leaf possess gastroprotective properties, aiding in the inhibition of pathogenic bacteria and supporting the growth of beneficial gut bacteria (Ugbogu *et al*., 2021). Similarly, in Ghana, bitter leaf is used to treat digestive problems, underscoring its regional significance (Dandi, 2022; Akah, 2024).

Skin Conditions and Biochemical Mechanisms:

Skin conditions such as eczema, acne, and fungal infections are common in Nigeria. *Tithonia diversifolia* (wild sunflower) is traditionally applied to manage these skin issues. The plant's flavonoids, terpenoids, and essential oils exhibit antimicrobial and anti-inflammatory properties, which can help alleviate symptoms associated with skin conditions (Ajao & Moteetee, 2017). In South Africa, *Tithonia diversifolia* is also used for similar purposes, demonstrating the plant's broader medicinal relevance (Abeyrathne, *et al.,*2021; Ndhlovu, *et al.*,2021; Rai, *et al.,* 2023).

Respiratory Disorders and Biochemical Mechanisms:

Respiratory conditions like asthma and bronchitis are prevalent health concerns in Nigeria. *Eupatorium odoratum* (bitter bush) has a long history of use for managing these disorders. The flavonoids and terpenoids in bitter bush have bronchodilatory and anti-inflammatory effects, potentially aiding in symptom relief (Bhattacharya *et al.,* 2021). In Tanzania, the plant is also used for respiratory ailments, highlighting its effectiveness across different African regions (Abate, *et al*.,2021; Siddique, *et al*.,2021; Letsyo, *et al.*,2023).

Other Traditional Uses and Biochemical Mechanisms:

Asteraceae plants are utilized in Nigeria to address various health conditions, including fever, malaria, and diabetes. The alkaloids, flavonoids, and terpenoids in these plants exhibit antipyretic, antimalarial, and antidiabetic activities (Ogbole, *et al*., 2017). Beyond Nigeria, in countries like Uganda and Cameroon, similar uses of Asteraceae plants are reported, demonstrating their significance in traditional medicine across the continent (Philippe, *et al.*, 2020; Yimta, *et al.,* 2021; Pungong, *et al.,* 2023; Tabuti, *et al.,* 2023).

PHARMACOLOGICAL ACTIVITIES AND BIOCHEMICAL MECHANISMS OF ACTION

The pharmacological activities of Asteraceae plants in Nigeria are extensive and have been attributed to various bioactive compounds present in the plants such as flavonoids, terpenoids, alkaloids, and phenolic compounds. These compounds interact with specific cellular targets and signaling pathways in the body, leading to the observed pharmacological effects (Obode, *et al.*, 2020; Ohiagu, *et. al.*, 2021; Arunsi, *et al.*, 2022). Several studies have reported the anti-inflammatory activity of Asteraceae plants, which has been linked to the inhibition of various pro-inflammatory cytokines and enzymes such as cyclooxygenase-2 *(COX-2*) and *nuclear factor-κB (NF-κB).* For instance*, studies indicate that Ageratum conyzoides* and *Vernonia amygdalina* have significant anti-inflammatory activities mediated by the inhibition of *COX-2* and *IL-1β* in animal models (Akhtar, 2022; Sibeko, *et al*, 2023).

Asteraceae plants have also been reported to possess potent antioxidant activities. The antioxidant activities of these plants have been attributed to various bioactive compounds such as flavonoids, phenolic acids, and sesquiterpene lactones. For example, the flavonoid-rich extract of *Tithonia diversifolia* was found to have strong antioxidant activity, as evidenced by its ability to scavenge free radicals and reduce oxidative stress (Pretti, *et al.,* 2018). Moreover, research shows that Asteraceae plants possess significant antimicrobial activities. The antimicrobial activities of these plants have been attributed to various bioactive compounds such as sesquiterpene lactones, flavonoids, and essential oils. For instance, the essential oil of Artemisia annua was found to possess significant antimicrobial activity against various pathogenic microorganisms such as Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans (Zeb, *et al*., 2019).

Furthermore, Asteraceae plants have been reported to possess anticancer activities. The anticancer activities of

these plants have been attributed to various bioactive compounds such as sesquiterpene lactones, flavonoids, and terpenoids, and their ability to induce apoptosis, inhibit cell proliferation, and disrupt tumor angiogenesis. For example, the sesquiterpene lactones from *Tithonia diversifolia* were found to exhibit significant cytotoxic activities against human cancer cell lines (Ajao & Moteetee, 2017). In addition, Asteraceae plants have been reported to possess immunomodulatory activities. The immunomodulatory activities of these plants have been attributed to various bioactive compounds such as polysaccharides and flavonoids. For instance, the polysaccharide-rich extract of *Sphaeranthus* africanus was found to possess significant immunomodulatory activity, as evidenced by its ability to enhance the proliferation of T and B lymphocytes in vitro (Oladimeji, *et al.*, 2018).

Other pharmacological activities of Asteraceae plants in Nigeria include analgesic, antidiabetic, and hepatoprotective activities. These activities have been attributed to various bioactive compounds such as sesquiterpene lactones, flavonoids, and phenolic acids. For example, the sesquiterpene lactones from Vernonia amygdalina were found to possess significant analgesic activity in animal models (Kadiri & Olawoye, 2016; Batiha, *et al*., 2020).

The biochemical mechanisms underlying the pharmacological activities of Asteraceae plants in Nigeria are diverse and complex. These mechanisms include the modulation of various signaling pathways, such as the NF-κB and MAPK pathways, as well as the regulation of various enzymes and receptors, such as COX-2, iNOS, and PPARγ (Arunsi, *et al.*, 2022; Olawale, *et al.*,2022; Salimo, *et al.,*2023). Further studies are needed to fully elucidate the biochemical mechanisms underlying the pharmacological activities of Asteraceae plants in Nigeria.

SAFETY AND TOXICITY CONSIDERATIONS

The safety and toxicity considerations of medicinal plants are important to understand before their use in treating diseases. Although medicinal plants have many therapeutic benefits, they can also cause side effects, interact with medications, and even lead to toxicity and overdose (Gouws, *et al.*,2021). Side effects and contraindications of medicinal plants vary depending on the plant and its active components. For example, Artemisia absinthium has been used to treat gastrointestinal disorders. Still, it can also cause seizures, hallucinations, and liver damage if used in large amounts or for a prolonged period (Tordjman, *et al.*, 2017). Similarly, *Centella asiatica* has been used to enhance cognitive function, but it can also cause allergic reactions and gastrointestinal upset (Sabaragamuwa *et al.*, 2018).

Medicinal plants can also interact with medications and alter their efficacy or toxicity. For example, Ginkgo biloba can interact with blood thinners, such as warfarin, and increase the risk of bleeding (Di Minno, et al., 2017). St. John's Wort can interact with antidepressants, such as selective serotonin reuptake inhibitors (SSRIs), and reduce their effectiveness (Cui, 2016). Toxicity and overdose of medicinal plants can occur when they are used in large amounts or for a prolonged period. For example, the use of Aloe vera in large amounts or for a prolonged period can cause diarrhea, abdominal pain, and kidney damage (Ibrahim, *et al*., 2022). Similarly, the use of Echinacea purpurea in high doses and for a prolonged period can cause liver damage (Cock, 2015; Oyedepo, & Palai, 2021).

It is important to note that not all medicinal plants are safe for use during pregnancy and breastfeeding. Some plants can cause miscarriage or harm to the fetus or infant. For example, the use of blue cohosh during pregnancy can cause birth defects (Farzaei, *et al.*, 2020). Therefore, before using medicinal plants, it is important to consult a healthcare provider and research their safety and potential interactions with medications.

4.0 CONCLUSION

The Asteraceae family of plants has been used traditionally in Nigeria to treat a wide range of ailments, including digestive disorders, respiratory illnesses, and skin conditions. Phytochemical analysis has revealed that these plants contain a diverse array of bioactive compounds, which have been shown to possess a variety of pharmacological activities. However, more research is needed to fully understand the therapeutic potential and biochemical roles of these compounds in the human body.

REFERENCES

Abate, L., Bachheti, A., Bachheti, R. K., & Husen, A. (2021). Antibacterial properties of medicinal plants: recent trends, progress, and challenges. *Traditional herbal therapy for the human immune system*, 13-54.

Abeyrathne, T., Harris, K. D., & Attanayaka, A. M. K. D. M. (2021). Effect of Foliar Application of Wild Sunflower (Tithonia Diversifolia) Leaf Extract on

Yield Attributes of Vegetable Cowpea Cv. Bs-1 in Sandy Regosol. *World Journal of Current Scientific Research, World J. Cur. Sci. Res. (2021)*, *1*(2).

Adeleke, B. S., & Babalola, O. O. (2020). Oilseed crop sunflower (Helianthus annuus) as a source of food: Nutritional and health benefits. *Food Science & Nutrition*, *8*(9), 4666-4684.

Adeleye, O. A., Femi-Oyewo, M. N., Bamiro, O. A., Bakre, L. G., Alabi, A., Ashidi, J. S., & Fakoya, G. (2021). Ethnomedicinal herbs in African traditional medicine with potential activity for the prevention, treatment, and management of coronavirus disease 2019. *Future journal of pharmaceutical sciences*, *7*, 1-14.

Ajao, A. A., & Moteetee, A. N. (2017). Tithonia diversifolia (Hemsl) A. Gray. (Asteraceae: Heliantheae), an invasive plant of significant ethnopharmacological importance: A review. *South African Journal of Botany*, *113*, 396-403.

Akah, P. A. (2024). Vernonia amygdalina Del (Bitter leaf) a traditional anti-diabetic gold mine-Mini Review. *Journal of Ayurveda and Integrated Medical Sciences*, *9*(1), 170-175.

Akhtar, M. (2022). Anti-inflammatory Medicinal Plants of Bangladesh–A Pharmacological Evaluation. *Frontiers in Pharmacology*, 464.

Alhassan, A. J., Lawal, T. A., & Dangambo, M. A. (2017). Antidiabetic properties of thirteen ocal medicinal plants in Nigeria, a review. *J Pharma Res 2017a*, *6*(8), 2170-2189.

Anyiam, A. F., Obi, E., & Arinze-Anyiam, O. C. (2023). Assessment of the Phytochemical Constituents and Metabolites of Some Medicinal Plants and Herbal Remedies Used in the Treatment and Management of Injuries. In *Herbal Medicine Phytochemistry: Applications and Trends* (pp. 1-37). Cham: Springer International Publishing.

Arunsi, U. O., Chioma, O. E., Etusim, P. E., & Owumi, S. E. (2022). Indigenous Nigeria medicinal herbal remedies: A potential source for therapeutic against rheumatoid arthritis. *Experimental Biology and Medicine*, *247*(13), 1148-1178.

Batiha, G. E. S., Olatunde, A., El-Mleeh, A., Hetta, H. F., Al-Rejaie, S., Alghamdi, S., . & Rivero-Perez, N. (2020). Bioactive compounds, pharmacological actions, and pharmacokinetics of wormwood (Artemisia absinthium). *Antibiotics*, *9*(6), 353.

Bhattacharya, T., Dey, P. S., Akter, R., Kabir, M. T., Rahman, M. H., & Rauf, A. (2021). Effect of natural leaf extracts as phytomedicine in curing geriatrics. *Experimental Gerontology*, *150*, 111352.

Bora, K. S., & Sharma, A. (2011). The genus Artemisia: A comprehensive review. *Pharmaceutical Biology, 49*(2), 101-109. doi: 10.3109/13880209.2010.501823

Buwa-Komoren, L. V., Mayekiso, B., Mhinana, Z., & Adeniran, A. L. (2019). An ethnobotanical and ethnomedicinal survey of traditionally used medicinal plants in Seymour, South Africa: An attempt toward digitization and preservation of ethnic knowledge. *Pharmacognosy Magazine*, *15*(60), 115-123.

Carvalho, I. T., Estevinho, B. N., & Santos, L. (2016). Application of microencapsulated essential oils in cosmetic and personal healthcare products–a review. *International Journal of Cosmetic Science*, *38*(2), 109-119.

Chukwuma, D. M., Chukwuma, E. C., Ayodele, A. E., Oluwajobi, A. O., Ajewole, T. O., Adekoya, M. A., …& Durojaye, E. O. (2023). Angiosperm flora of Federal University Oye-Ekiti, Oye Campus–A Preliminary checklist. *Nigerian Journal of Botany Journal,36*(1),69-84.

Chukwuma, E. C., Chukwuma, D. M., & Adio, A. F. (2020). Flora diversity of Ijero Local Government Area of Ekiti State, South-Western Nigeria. *Tropical Plant Research*, *7*(1), 5-64.

Cock, I. E. (2015). The safe usage of herbal medicines: counter-indications, cross-reactivity and toxicity. *Pharmacognosy Communications*, *5*(1).32-39.

Cole, A. T., Keshinro, O. M., Sharaibi, O., & Adu, A. A. (2024). Conducting an Inventory and Ethnobotanical Assessment of Plant Species at Osun State College of Education in Ila- Orangun, Osun State, Nigeria. *Asian Journal of Research in Botany*, *7*(2), 151-163.

Cui, Y. H., & Zheng, Y. (2016). A meta-analysis on the efficacy and safety of St John's wort extract in depression therapy in comparison with selective serotonin reuptake inhibitors in adults. *Neuropsychiatric disease and treatment*, 1715-1723.

Dandi, S. O., Abarike, E. D., & Ampofo-Yeboah, A. (2022). Bitter Leaf Vernonia amygdalina Extract Enhances Growth, Hematology, Heat Stress Response, and Resistance to Aeromonas hydrophila in Nile Tilapia. *North American Journal of Aquaculture*, *84*(4), 432-441.

Di Minno, A., Frigerio, B., Spadarella, G., Ravani, A., Sansaro, D., Amato, M., ... & Baldassarre, D. (2017). Old and new oral anticoagulants: food, herbal medicines and drug interactions. *Blood reviews*, *31*(4), 193-203.

Di Sotto, A., Vitalone, A., & Di Giacomo, S. (2020). Plant-derived nutraceuticals and immune system modulation: an evidence-based overview. *Vaccines*, *8*(3), 468.

Dias, M. C., Pinto, D. C., & Silva, A. M. (2021). Plant flavonoids: Chemical characteristics and biological activity. *Molecules*, *26*(17), 53-62.

Durán, A. G., Rial, C., Gutiérrez, M. T., Molinillo, J. M., & Macías, F. A. (2021). Sesquiterpenes in fresh food. *Handbook of dietary phytochemicals*, 477-542.

Farzaei, M. H., Bayrami, Z., Farzaei, F., Aneva, I., Das, S. K., Patra, J. K., Das, G., & Abdollahi, M. (2020). Poisoning by Medical Plants. *Archives of Iranian medicine*, *23*(2), 117–127.

Gouws, C., & Hamman, J. H. (2020). What are the dangers of drug interactions with herbal medicines? *Expert opinion on drug metabolism & toxicology*, *16*(3), 165-167.

Ibrahim, T. A., Hassen, A., & Apostolides, Z. (2022). The Antimethanogenic Potentials of Plant Extracts: Their Yields and Phytochemical Compositions as Affected by Extractive Solvents. *Plants (Basel, Switzerland)*, *11*(23), 3296. https://doi.org/10.3390/plants11233296

Kadiri, O., & Olawoye, B. (2016). Vernonia amygdalina: An underutilized vegetable with nutraceutical Potentials–A Review. *Turkish Journal of Agriculture-Food Science and Technology*, *4*(9), 763-768.

Khanal, A., Devkota, H. P., Kaundinnyayana, S., Gyawali, P., Ananda, R., & Adhikari, R. (2021). Culinary herbs and spices in Nepal: A review of their traditional uses, chemical constituents, and pharmacological activities. *Ethnobotany Research and Applications*, *21*, 1-18.

Koul, B., Taak, P., Kumar, A., Khatri, T., & Sanyal, I. (2017). The Artemisia genus: A review on traditional uses, phytochemical constituents, pharmacological properties and germplasm conservation. *J. Glycomics Lipidomics*, *7*(1), 142.

Kumar, J., & Pundir, M. (2022). Phytochemistry and pharmacology of Saussurea genus (Saussurea lappa, Saussurea costus, Saussurea obvallata, Saussurea involucrata). *Materials Today: Proceedings*, *56*, 1173-1181.

Letsyo, E., Dzikunoo, J., Dzah, C. S., Adams, Z. S., & Asante-Donyinah, D. (2023). Hepatic phytotoxins in herbal medicines: a review of Africa's pyrrolizidine alkaloid-containing plants, their traditional uses, contamination pathways and associated health risks. *South African Journal of Botany*, *161*, 78-89.

Mailu, J. K. (2021). *Ethnopharmacological and Toxicological Study of Medicinal Plants Used Against Respiratory Infections in Kisumu East Sub-County* (Doctoral dissertation, University of Nairobi).

Mandal, S. K., Pal, H., Pal, I., & Bose, S. (2018). Biological Potential of Elephantopus scaber Linn. *International Journal of Pharmaceutical Sciences Review and Research*, *50*(2), 130-134.

Mandal, S. K., Debnath, U., Kumar, A., Thomas, S., Mandal, S. C., Choudhury, M. D., & Palit, P. (2020). Natural sesquiterpene lactones in the prevention and treatment of inflammatory disorders and cancer: A systematic study of this emerging therapeutic approach based on chemical and pharmacological aspect. *Letters in Drug Design & Discovery*, *17*(9), 1102-1116.

Matos, M. S., Anastácio, J. D., & Nunes dos Santos, C. (2021). Sesquiterpene lactones: Promising natural compounds to fight inflammation. *Pharmaceutics*, *13*(7), 991.

Mokua, S. K. (2021). *Ethnobotanical Documentation, Phytochemistry, and Cytotoxicity of Anti-snakebite Envenomation Plants of Mwingi West Sub-County, Kenya* (Doctoral dissertation, University of Nairobi).

Ndhlovu, P. T., Omotayo, A. O., Otang-Mbeng, W., & Aremu, A. O. (2021). Ethnobotanical review of plants used for the management and treatment of childhood diseases and well-being in South Africa. *South African Journal of Botany*, *137*, 197-215.

Newman, D. J., & Cragg, G. M. (2020). Natural Products as Sources of New Drugs over the Nearly Four Decades from 01/1981 to 09/2019. *Journal of Natural Products, 83*(3), 770-803.

Ngwuluka, N. C., Abu-Thabit, N. Y., Uwaezuoke, O. J., Erebor, J. O., Ilomuanya, M. O.,Mohamed, R. R., ... & Ebrahim, N. A. (2021). Natural polymers in micro-and nanoencapsulation for therapeutic and diagnostic applications: part II-polysaccharides

and proteins. *Nano Microencapsul Tech Appl*, *8*(9).

Nwozo, O. S., Effiong, E. M., Aja, P. M., & Awuchi, C. G. (2023). Antioxidant, phytochemical, and therapeutic properties of medicinal plants: A review. *International Journal of Food Properties*, *26*(1), 359-388.

Obode, O. C., Adebayo, A. H., Omohinmin, C. A., & Yakubu, O. F. (2020). A systematic review of medicinal plants used in Nigeria for hypertension management. *International Journal of Pharmaceutical Research (09752366)*, *12*(4).

Ogbu, C. P., Okagu, I. U., & Nwodo, O. F. C. (2020). Anti-inflammatory activities of crude ethanol extract of Combretum zenkeri Engl. & Diels leaves. *Comparative Clinical Pathology*, *29*, 397-409.

Ohiagu, F. O., Chikezie, P. C., Chikezie, C. M., & Enyoh, C. E. (2021). Anticancer activity of Nigerian medicinal plants: a review. *Future Journal of Pharmaceutical Sciences*, *7*, 1-21.

Ojo, O. A., Ojo, A. B., Barnabas, M., Iyobhebhe, M., Elebiyo, T. C., Evbuomwan, I. O., ... & Oloyede, O. I. (2022). Phytochemical properties and pharmacological activities of the genus Pennisetum: A review. *Scientific African*, *16*, e01132.

Ojo, O., Mphahlele, M. P., Oladeji, O. S., Mmutlane, E. M., & Ndinteh, D. T. (2022). From wandering weeds to pharmacy: An insight into traditional uses, phytochemicals and pharmacology of genus Chromolaena (Asteraceae). *Journal of Ethnopharmacology*, *291*, 115155.

Okaiyeto, K., & Oguntibeju, O. O. (2021). African herbal medicines: Adverse effects and cytotoxic potentials with different therapeutic applications. *International journal of environmental research and public health*, *18*(11), 5988.

Oladimeji, F. A., Afolayan, A. J., & Bradley, G. (2018). Immunomodulatory effects of polysaccharide-rich extract from Sphaeranthus africanus on the immune response to ovalbumin in BALB/c mice. BMC Complementary and Alternative Medicine, 18(1), 1-9.

Olawale, F., Olofinsan, K., & Iwaloye, O. (2022). Biological activities of Chromolaena odorata: A mechanistic review. *South African Journal of Botany*, *144*, 44-57.

Omokhua, A. G., McGaw, L. J., Finnie, J. F., & Van Staden, J. (2016). Chromolaena odorata (L.) RM King & H. Rob. (Asteraceae) in sub-Saharan Africa: A synthesis and review of its medicinal potential. *Journal of ethnopharmacology*, *183*, 112-122.

Oyedepo, T. A., & Palai, S. (2021). Herbal remedies, toxicity, and regulations. In *Preparation of Phytopharmaceuticals for the Management of Disorders* (pp. 89-127). Academic Press.

Patel, K., & Patel, D. K. (2017). Medicinal importance, pharmacological activities, and analytical aspects of hispidulin: A concise report. *Journal of Traditional and Complementary Medicine*, *7*(3), 360-366.

Pavela, R., Dall'Acqua, S., Sut, S., Baldan, V., Kamte, S. L. N., Nya, P. C. B., ... & Benelli, G. (2018). Oviposition inhibitory activity of the Mexican sunflower Tithonia diversifolia (Asteraceae) polar extracts against the two-spotted spider mite Tetranychus urticae (Tetranychidae). *Physiological and Molecular Plant Pathology*, *101*, 85-92.

Philippe, O. N., Pierre, D., & JB, L. S. (2020). Ethnobotanical study of plants used as antimalarial in traditional medicine in Bagira in Eastern RD Congo. *Journal of Pharmacognosy and Phytochemistry*, *9*(4), 01-14.

Prasathkumar, M., Anisha, S., Dhrisya, C., Becky, R., & Sadhasivam, S. (2021). Therapeutic and pharmacological efficacy of selective Indian medicinal plants–a review. *PhytomedicinePlus*, *1*(2), 100029.

Pretti, I. R., da Luz, A. C., Jamal, C. M., & Batitucci, M. D. C. P. (2018). Variation of biochemical and antioxidant activity with respect to the phenological stage of Tithonia diversifolia Hemsl. (Asteraceae) populations. *Industrial Crops and Products*, *121*, 241-249.

Pungong, C. S., Langsi, D. J., & Fotso, B. (2023). Knowledge, Aptitudes and Practice on Traditional Medicinal Plant use in Bafanji Village (Ngoketunjia Division, North West Region, Cameroon). *Journal of Biotechnology*, *2*(1), 1-21.

Rai, P. K., Lee, S. S., Bhardwaj, N., & Kim, K. H. (2023). The environmental, socio-economic, and health effects of invasive alien plants: Review on Tithonia diversifolia (Hemsl.) A. Gray in Asteraceae. *South African journal of botany*, *162*, 461-480.

Rolnik, A., & Olas, B. (2021). The plants of the Asteraceae family as agents in the protection of human health. *International Journal of Molecular Sciences*, *22*(6), 3009.

Sabaragamuwa, R., Perera, C. O., & Fedrizzi, B. (2018). Centella asiatica (Gotu kola) as a neuroprotectant and its potential role in healthy ageing. *Trends in Food Science & Technology*, *79*, 88-97.

Saha, S., & Paul, S. (2019). A review on phytochemical constituents and pharmacological properties of Enhydra fluctuans Lour. *Journal of Pharmacognosy and Phytochemistry*, *8*(2), 887-893.

Salimo, Z. M., Yakubu, M. N., da Silva, E. L., de Almeida, A. C., Chaves, Y. O., Costa, E. V., & Koolen, H. H. (2023). Chemistry and pharmacology of bergenin or its derivatives: A promising molecule. *Biomolecules*, *13*(3), 403.

Sibeko, L., Johns, T., & Hsiao, B. S. (2023). Traditional perinatal plant knowledge in Sub-Saharan Africa: Comprehensive compilation and secondary analysis. *South African Journal of Botany*, *154*, 120-139.

Siddique, H., Pendry, B., Rashid, M. A., & Rahman, M. M. (2021). Medicinal plants used to treat infectious diseases in the central part and a northern district of Bangladesh–An ethnopharmacological perception. *Journal of Herbal Medicine*, *29*, 100484.

Sirinthipaporn, A., & Jiraungkoorskul, W. (2017). Wound healing property review of siam weed, Chromolaena odorata. *Pharmacognosy Reviews*, *11*(21), 35.

Stephen Anapuwa, D., & Folusho, I. (2016). A Review of Medicinal and Pharmaceutical Properties of Some Selected Nigerian Plants. *Biosciences Biotechnology Research Asia*, *8*(1), 171-174.

Suja, S. R., Aswathy, V., Bijukumar, B. S., & Prakashkumar, R. (2024). Flavonoids of Asteraceae-Promising Anti-Inflammatory Agents. In *Flavonoids as Nutraceuticals* (pp. 121-141). Apple Academic Press.

Tabuti, J. R., Obakiro, S. B., Nabatanzi, A., Anywar, G., Nambejja, C., Mutyaba, M. R., & Waako, P. (2023). Medicinal plants used for treatment of malaria by indigenous communities of Tororo District, Eastern Uganda. *Tropical medicine and health*, *51*(1), 34.

Tasneem, S., Liu, B., Li, B., Choudhary, M. I., & Wang, W. (2019). Molecular pharmacology of inflammation: Medicinal plants as anti-inflammatory agents. *Pharmacological Research*, *139*, 126-140.

Tordjman, S., Chokron, S., Delorme, R., Charrier, A., Bellissant, E., Jaafari, N., & Fougerou, C. (2017). Melatonin: Pharmacology, Functions and Therapeutic Benefits. *Current neuropharmacology*, *15*(3), 434–443.

Ugbogu, E. A., Emmanuel, O., Dike, E. D., Agi, G. O., Ugbogu, O. C., Ibe, C., & Iweala, E. J. (2021). The phytochemistry, ethnobotanical, and pharmacological potentials of the medicinal plant-Vernonia amygdalina L.(bitter Leaf). *Clinical Complementary Medicine and Pharmacology*, *1*(1), 100006.

Wang, M., Cui, L., Feng, K., Deng, P., Du, X., Wan, F., ... & Nie, X. (2015). Comparative analysis of Asteraceae chloroplast genomes: structural organization, RNA editing and evolution. *Plant Molecular Biology Reporter*, *33*, 1526-1538.

Xuan, T. D., & Khanh, T. D. (2016). Chemistry and pharmacology of Bide overview. *Journal of pharmaceutical investigation*, *46*, 91-132.

Yimta, F. W., Olivia, G. T. C., Matchawe, C., Jonas, K., Francois, N., & Joseph, N. (2021). Ethnopharmacological survey of antimalarial plants and the biological activities of Conyza aegyptiaca (Asteraceae). *Journal of Pharmacognosy and Phytochemistry*, *10*(3), 11-22.

Zeb, S., Ali, A., Zaman, W., Zeb, S., Ali, S., Ullah, F., & Shakoor, A. (2019). Pharmacology, taxonomy and phytochemistry of the genus Artemisia specifically from Pakistan: a comprehensive review. *Pharmaceutical and Biomedical Research*.14(2),44-5

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ECONOMIC IMPACTS OF TOURISM INDUSTRY ACTIVITIES IN ENUGU STATE, NIGERIA

[1]Amalu Titus Ejiofor and [2]Majebi Enesi Chukwuemeka
[1]Department of Social Sciences, School of General Studies, Enugu State Polytechnic, Iwollo Enugu State, Nigeria
[2]Department of tourism Studies, National Open University of Nigeria
Corresponding Email: titiagento@gmail.com; emajebi@noun.edu.ng

ABSTRACT
Tourism increases business and employment opportunities and contributes largely to the development of the economy of host communities. This paper examines the impact of the tourism industry activities on the economic development of Enugu State, Nigeria. Primary and secondary sources of data were employed to elicit data for the study and the study population comprised 1,800 household heads and 60 managers of tourism outfits from six Local Government Areas (Ezeagu, Udi, Nsukka, Isi uzo, Enugu East and Enugu North) of Enugu State. The study results show that a total of 6,765,818 tourists visited the study area between 2021 and 2023 with 1,590,970 tourists visiting in 2021, 1,934,268 tourists in 2022 and 3,240,580 tourists in 2023 which revealed a gradual but steady increase in tourists arrivals within the study locations. The study also shows that 2,984,226 tourists representing 44% of the entire tourists arrivals attended cultural events, 1,246,071 tourists representing 18% of the tourists attended sports activities/events while 1,952,279 tourists' representing 29% and 583,242 tourists representing 9% of the tourists' visited natural attractions and patronized drinking spots/restaurants within the study locations respectively. The study also revealed that 54% of the people were involved in non-tourism jobs while 44% were involved in tourism related jobs with 19% involved in the transport sector, 12% in the hotel industry while 16% were involved in the drinking/restaurant jobs. The study further reveals that the tourism industry attracted benefits such as an increase in business and employment opportunities, increasing family income and government revenue and provision of social and basic infrastructure while some challenges that accompany the tourism industry are increasing indiscriminate solid waste disposal, decaying standard of living, increasing rates of crime, drug addiction, promiscuity and divorce. Based on these findings, the study recommend that government should collaborate and encourage private sector investments by reducing taxation and regulating costs of rents while making policies that will improve the living standards of the local people in order to reduce their involvement in crime, drug addiction, social vices and promiscuity.

Keywords: *Tourism industry, Economic impacts, Employment opportunities, Tourists arrivals, Cultural events*

1.0 INTRODUCTION
Tourism is a product that depends solely on the simultaneous production and consumption of destination based products (Draper & Dixon, 2021; Bello & Bello, 2021). The implication of this for the destination area is that it will come into contact with a diverse population during the production process. This contact can be favorable or unfavorable to the local people depending on their background, cultural difference and the nature of the contact (Majebi & Amalu, 2023; Adesina-Uthman, Majebi, Fagbolu & Obaka, 2023). Tourism can be beneficial, developmental and be sustained when local people have a positive attitude towards its activities and when they perceive their role in the planning and implementation process of the tourism development as being rewarding and vital to their individual and general growth (Ademomon & Maijamaa, 2020). The tourism industry brings about a renewed quality, values and radical changes in the lives of local people which drives them into believing in the realities of socio-economic and socio-cultural possibilities (Ajake & Amalu, 2012; Ajake & Amalu, 2012b). The tourism and hospitality industry plays a vital economic role in the economy of local people and host communities throughout the world as it creates employment and business opportunities which improves their standard of living and increase the potentials of meeting their needs (UNWTO, 2022). The tourism industry is one of the world's largest industries, generating US$6 trillion or 9% of global GDP and supporting 260 million jobs (Senbeto, 2022). Many of those jobs are created by the hospitality sector, giving the tourism industry a tremendous opportunity to help local communities prosper (UNWTO, 2023). Tourism is ideally known to generate revenue and wealth to investors of different countries across the world and Nigeria is endowed with so many tourist attractions and potentials as well as several tourism resources that can attract tourists and visitors from every part of the world and it has the potential to provide abundant employment and business opportunities to the local and foreign prospective tourism investors' viz-a-vis increase government earnings (Ajake, Enang, Amalu & Ojugbo, 2016). Furthermore, Nigeria being a giant land with the Savannah-Sahel in the North, the Hills and Mountains in

the East and the Lagoons and Forests in the West is blessed with attractions that can adequately enhance the revenue portfolio of the Nation (Amalu & Ajake, 2014; 2015). It is widely recognized that tourism is an important factor that can contribute to the development of market-oriented economy. It can also be emphasized that tourism is directly linked with the cultural, economic and intellectual potential of a country. It was noticed that in the early twenty-first century that the number of tourists increased dramatically and consequently the revenues from tourism increased considerably (Bello & Majebi, 2018; Amalu, Phil-Eze & Ajake, 2020).

In recent times, scholars have highlighted that diversification of a country or region's economic potentials is a sign and powerful factor of economic development, hence tourism which have diversified many country's can be emphasized as a powerful economic tool which ensures a sustainable source of wealth (Greg & Carlos, 2022; Gomez, 2021; Gossling, Scott & Hall, 2020; Gold & Gold, 2020).

The tourism industry has been reported to have overbearing direct impacts on the economy of its host community through the provisions of employment (although in some cases temporal and insecure), structural development, exposure, income generation, foreign exchange generation, it also has indirect impacts on the economy of its host community through its boost on the existence and survival of support tourists' facilities like; the transport sector, tour guides, arts and craftsmen, food and beverages sector, security operatives, restaurants, drinking spots, club houses and the local market men and women who all benefit from the trickle-down effect or multiplier effect of the tourists' presence whose duration of stay is most determined by the satisfaction upon the services and facilities rendered (Richards & Kings, 2022; Sharma, Thomas & Justin, 2021).

Enugu State, located in the Southern part of Nigeria, is known for its rich tourism and cultural value system, which attracts people to the region to enjoy the rich, unique, and fascinating natural attractions and cultural values of the people exhibited during tourism and cultural events within the State. The people of Enugu State have rich and unique tourism potentials and numerous cultural festivals and events hosted in different Local Government Areas within the State across the year which attracts tourists and visitors moving within the State, other States and from other countries to experience the tourism products and activities (Iwara and Amalu, 2017; Takon and Amalu, 2013). Consequently, several scholars (Majebi and Anieobi, 2017; Takon, Amalu and Okpara, 2013) have reported that the tourism industry of Enugu State have attracted a lot of interests and popularity among tourists and visitors across the world with increasing number of people visiting the State. Unfortunately, little or no research have been carried out to investigate the economic impacts of the tourism industry on the local people and host communities across the State, hence the desire of this study to investigate the economic impacts of tourism on the local people and host communities of Enugu State, Nigeria

2.0 METHODOLOGY

Enugu State is in Eastern Nigeria (figure 1). It has a total area of 7,161km and a density of 780/km2. The study area covers three senatorial districts of Enugu State. These are Enugu North, Enugu East, and Enugu West senatorial districts. These comprise the six major districts, Ezeagu and Udi (Enugu West senatorial district); Nsukka and Isi-Uzo (Enugu North senatorial district) and Enugu East and Enugu South (Enugu East senatorial district) which were selected for the study. Enugu State has many tourist resources, facilities, and attractions (figure 2) (Amalu, Otop and Ojugbo, 2018; Amalu, Otop, Duluora, Omeje and Emeana, 2017). Information on Figure 2 shows that 43 tourism attractions are available within Enugu State. The State has ecotourism attractions with historical, cultural, spiritual, religious, traditional, and sometimes aesthetical value. It also has lakes, caves, hills, waterfalls, and springs. This is in addition to scheduled cultural festivals, galleries and monuments, and archaeological sites which facilitate the hosting of numerous cultural events within the State. Other tourism facilities and infrastructures within the State include; hotels, shopping malls, telecommunications, and transport outfits. Some cultural activities in Enugu include the Mmanwu (masquerade) festival, traditional dance troupes, chieftaincy coronation ceremonies, Ozo-title ceremonies, traditional marriage ceremonies, and the new-yam festival (*Iri-ji*) (Enugu State Ministry of Culture and Tourism, 2024).

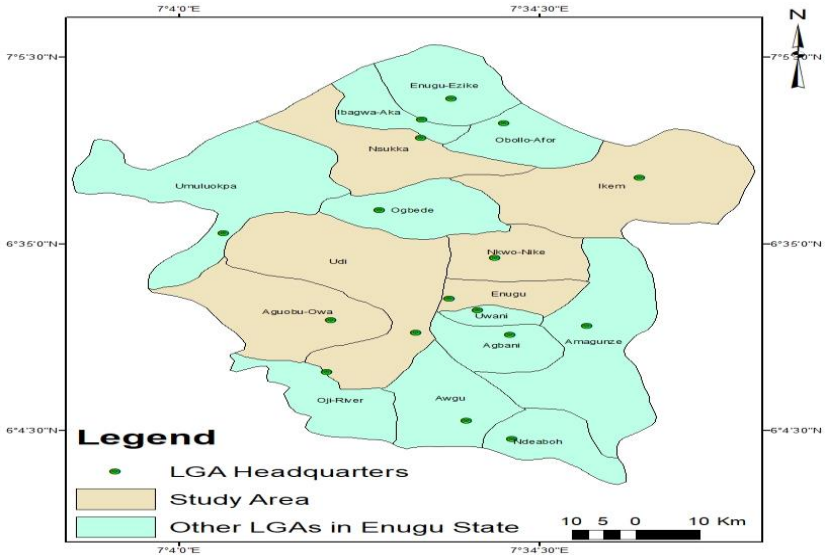


Figure 1: Map of Enugu State showing the study area.
Source: GIS Department of the Enugu State Ministry of Lands (2024)

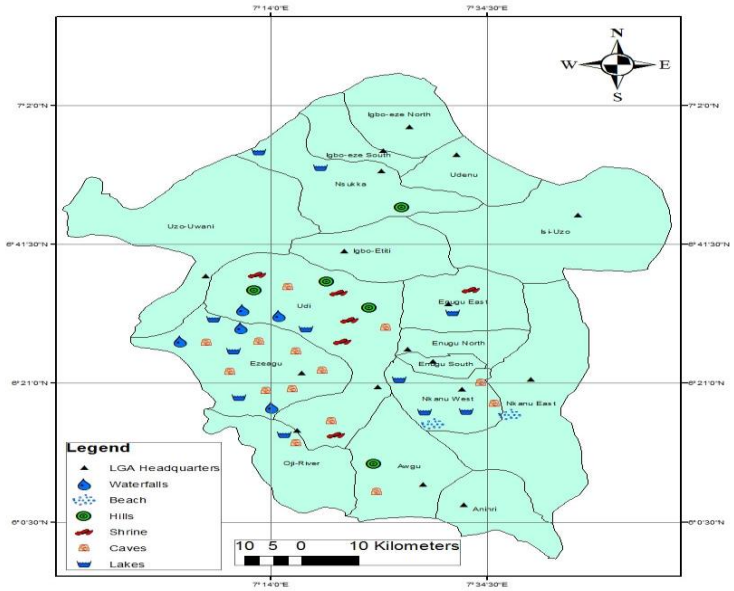


Figure 2: Map showing the spread of tourism sites across Enugu State.
Source: GIS Department of the Enugu State Ministry of Lands (2024).

The study purposively selected six local government areas (two each from the three senatorial districts) within Enugu State for the study. The choice of the study locations is based on the predominance of tourism and cultural activities within the State. The study adopted both primary and secondary sources of data collection methods to elicit information for the study. The primary source involved using questionnaire survey and interview sessions. The secondary sources involved yearbooks, annual reports, articles, and journals from government and private tourism-based institutions and the Internet. Interview sessions were held with two key informants (the traditional ruler and the town union leaders from all the six study locations. The study population comprised of household heads randomly selected from the communities within the study locations. The population of the study is made up of 1,800 household heads randomly selected from the study

locations (300 from each of the six study locations) and 60 randomly selected managers of tourism outfits within the study locations (10 from each of the six study locations) making a total of 1,860 respondents. Two sets of questionnaire (one for the household heads and one for the managers of tourism outfits) was used to elicit information for the study while a check-list was designed to guide the interview sessions with the key informants. The study derived the following data during the research: (i) information on the number on number of tourists and visitor arrivals in the State (ii) occupational characteristics of the people (iii) choice preference of the tourists and visitors (iii) patronage and attendance to tourism and cultural facilities and events in the study locations (iv) benefits and challenges of tourism and cultural activities. Data collected was presented with tables, graphs and charts while there were analyzed with descriptive statistics such as mean, simple percentages and standard deviation.

3.0 RESULTS AND DISCUSSION

Information on table 1 show that a total of 6,765,818 visitors visiting the study locations between 2021 and 2023. The table also revealed that the highest number of visitors was recorded in 2023 with 3,240,580 visitors representing 47% of the entire visitor's record followed by 1,934,268 visitors representing 29% of the entire visitors to the area while the least number of visitors to the area was recorded in 2021 with 1,590,970 visitors representing 24% of the entire visitors to the area. This further revealed that there was a steady increase in the number of visitors to the study locations. Information on figure 3 shows the visitors arrivals pattern in the study locations with Enugu East recording 34% of the entire visits, followed by Enugu north with 18%, Ezeagu with 16%, Nsukka and Udi with 12% of the entire visitors while the least number of visitor's arrivals was recorded in Isi-Uzo with 8% of the entire visitors to the study locations.

Table 1: Tourists/visitors arrivals in the study locations

Study locations	2021	2022	2023	Total	(%)
Ezeagu	187,456	324,671	557,103	1,069,230	16
Udi	164,320	201,569	436,034	801,923	12
Nsukka	130,121	200,101	460,099	790,321	12
Isi-Uzo	131,190	164,822	277,330	573,342	8
Enugu East	678,980	701,345	951,775	2,332,100	34
Enugu North	298,903	341,760	558,239	1,198,902	18
Total	1,590,970	1,934,268	3,240,580	6,765,818	100
(%)	24	29	47	100	

Source: Researcher's field survey, 2024

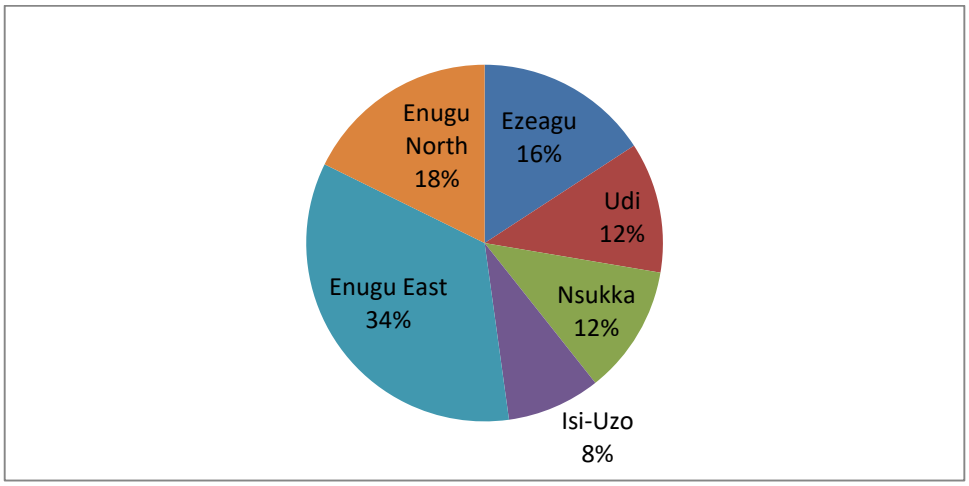


Figure 3: Number of visitors visit to the study locations (2021-2023)
Source: researcher's field survey, 2024

Information on figure 4 shows the visitor's visitation pattern to the study area. The figure shows that the number of visitors kept on increasing from 2021 to 2023.

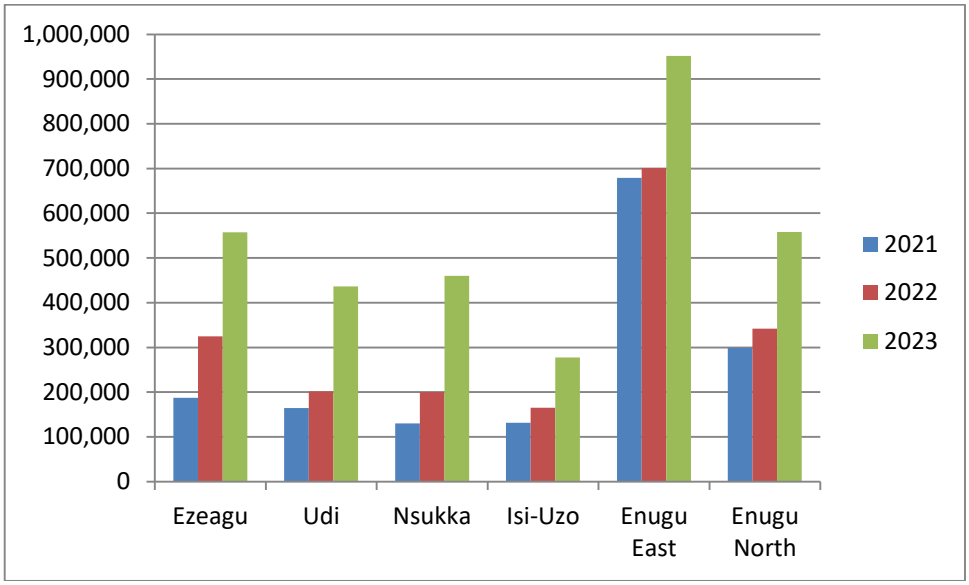


Figure 4: Visitors visitation pattern in the study locations
Source: researcher's field survey, 2024

Information on table 2 shows that a total of 6,765,818 visitors visiting the study locations. The table further revealed that a total of 3,422,702 visitors representing 51% of the entire visitors visited the study locations from other Nigerian States (other states within Nigeria) followed by visitors visiting the study location from other African countries with 2,263,144 visitors representing 33% of the entire visitors to the study locations, and 1,079,972 visitors representing 16% of the entire visitors visit to the study locations. This goes ahead to reveal that tourism was viable in the study locations and Enugu State.

Table 2: Origin of tourists and visitors to tourism outfits and events (2021-2023)

Study locations	Total arrivals (2021-2023)	Origin of tourists and visitors		
		Other Nigerian States	African countries	Outside Africa
Ezeagu	1,069,230	568,211	367,691	133,328
Udi	801,923	396,396	297,800	107,727
Nsukka	790,321	411,276	206,911	172,134
Isi-Uzo	573,342	302,002	189,020	82,320
Enugu East	2,332,100	1,102,006	820,110	409,984
Enugu North	1,198,902	642,811	381,612	174,479
Total	6,765,818	3,422,702	2,263,144	1,079,972
(%)	100	51	33	16

Source: researcher's field survey, 2024

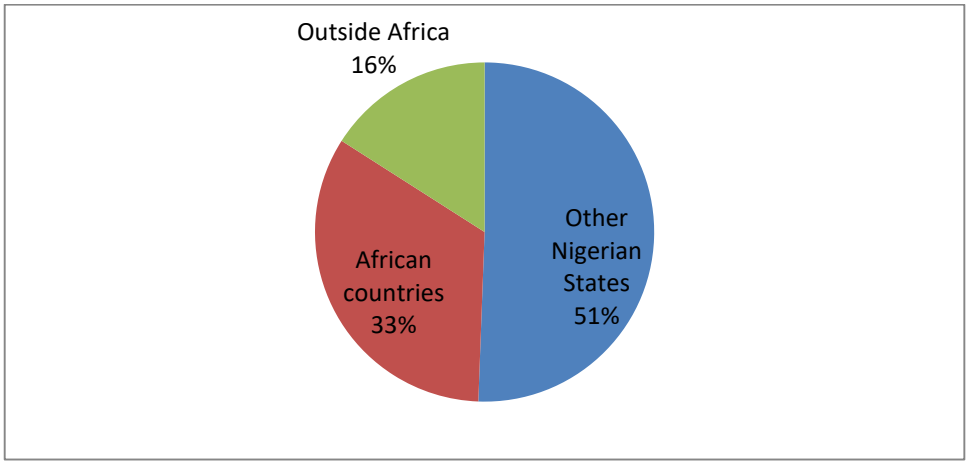


Figure 5: Pattern of visitors' arrivals in the study locations
Source: researcher's field survey, 2024

In a bid to examine the preference of the visitors who visited the study locations, the study investigated the level of patronage of the tourism outfits in the study locations. It was observed that 4,605,243 visitors out of the 6,765,818 visitors which visited the study locations between 2021 and 2023 which represents 68% of the total number of visitors to the study area spent a night at the study location. The study also observed that a total of 2,984,226 visitors patronized or visited the State for the purpose of attending cultural events within the study locations followed by 1,952,279 visitors representing 29% of the entire visitors which patronized the drinking spots/ restaurants, followed by 1,246,071 visitors representing 18% of the entire visitors patronizing the sporting events and facilities. The least patronage was those who visited tourism natural attraction with 583, 242 visitors representing 9% of the entire visitors. The pattern of visits between the day-time visitors and overnight visitors was revealed on figure 6 with 68% of the entire visitors being over-night visitors (visitors that spent a night in the study area) while 32% of the visitors were day-time visitors to the study area (visitors who didn't spent night within the study locations.

Table 3: Tourist's and visitor's preferences of tourism facility in the study area (2021-2023)

Study locations	Accommodation	Cultural events	Sports activities	Natural attractions	Drinking/ restaurant	Total
Ezeagu	858,221	595,110	165,789	198,891	288,922	1,249,712
Udi	652,001	590,140	146,980	123,401	298,911	1,159,432
Nsukka	476,911	445,600	123,170	52,670	234,400	855,840
Isi-Uzo	387,900	526,002	118,900	60,800	231,916	937,618
Enugu East	1,450,000	501,659	301,231	67,110	429,171	1,299,171
Enugu North	780,210	324,715	390,001	80,370	468,959	1,264,045
Total	4,605,243	2,984,226	1,246,071	583,242	1,952,279	6,765,818
(%)	68	44	18	9	29	100

Source: researcher's field survey, 2024

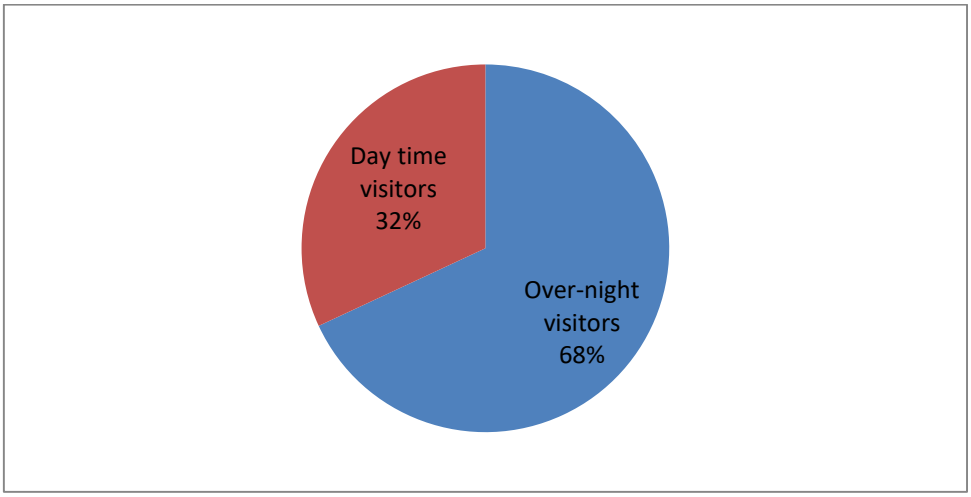


Figure 6: Pattern of day-time and over-night visitors to the study locations
Source: researcher's field survey, 2024

In a bid to examine the economic potential of the tourism industry on the local people and communities, table 4, shows that a total of 932 people engaged in tourism related jobs while 1092 people were engaged in non-tourism related jobs representing 46% and 54% of the entire people respectively.

Table 4: Occupational structure of the people of the study area

Study location	Tourism related jobs			Non-tourism related jobs			Total
	Hotel	Transport	Drinking spot	Artisan	Trading	Farming	
Ezeagu	44	62	65	56	86	82	395
Udi	32	62	52	36	66	85	333
Nsukka	32	53	48	34	82	89	338
Isi-Uzo	20	62	46	28	88	82	326
Enugu East	56	68	51	45	72	32	324
Enugu North	52	69	58	32	64	33	308
Total	236	376	320	231	458	403	2024
(%)	12	19	16	11	23	20	100
Total (%)	932 (46)			1092 (54)			2024 (100)

Source: researcher's field survey, 2024

Information on figure 7 reveals that there were direct benefits from the tourism industry in the study locations ranging from provision of employment opportunities and business opportunities with 25% response respectively, followed by increasing family income and government revenue with 15% respectively, then infrastructural development with 12% response and improved aesthetics with 8% response level.

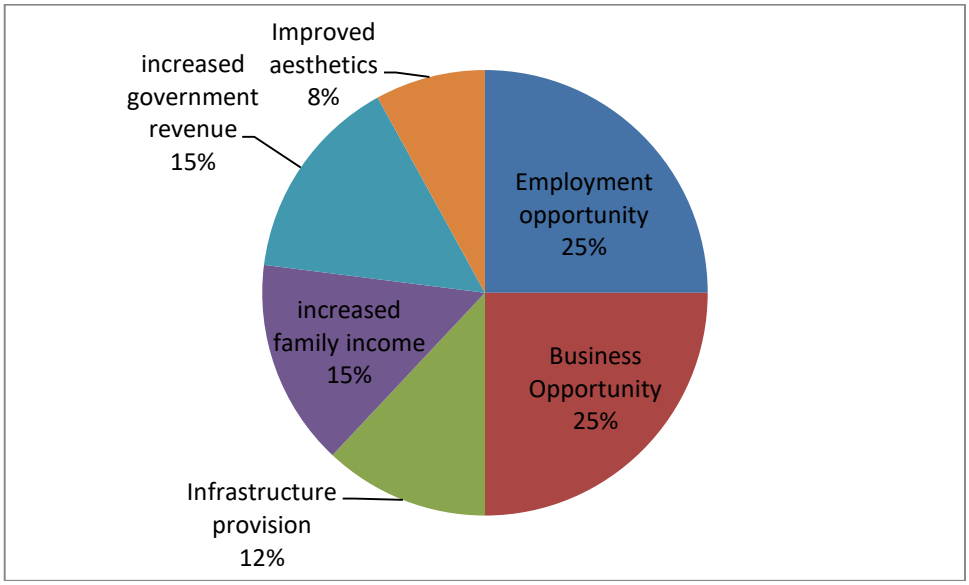


Figure 7: benefits of the tourism industry within the study locations
Source: researcher's field survey, 2024

The study examined the challenges accompanying the tourism industry to the study location. It was observed that the challenges ranged from increasing indiscriminate wastes disposal with 20% responses, high taxation and high inflation rate with 15% responses respectively, increasing rate of promiscuity among women and increasing cases of divorce with 12% response respectively, increasing crime rates with 10% responses to increasing cases of social vices and traffic congestion with 8% response respectively.

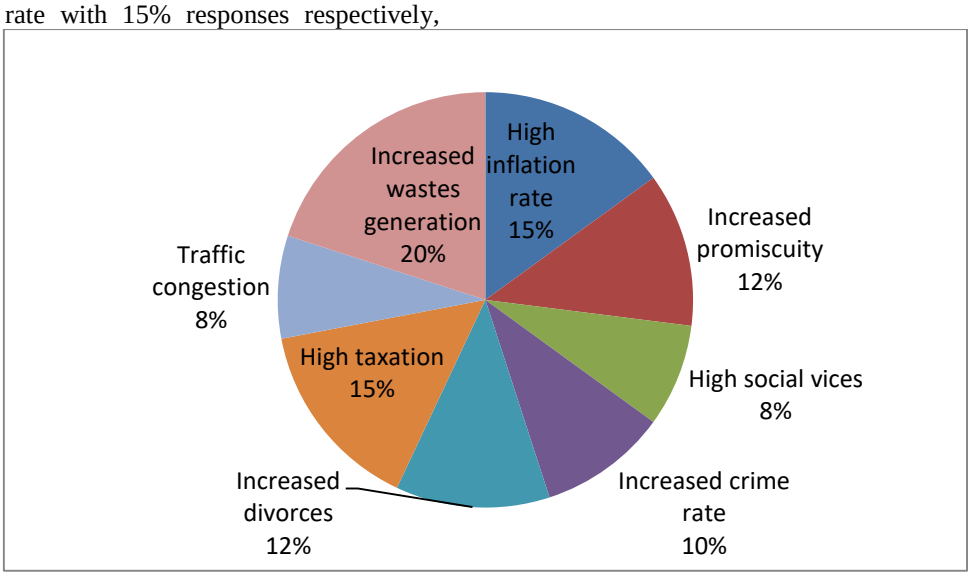


Figure 8: Challenges from the tourism industry within the study locations
Source: researcher's field survey, 2024

4.0 CONCLUSION

The study examined the economic impacts of the tourism industry in Enugu State. The study revealed that visitors arrivals in the State for tourism related purposes was in the increase from 2021 to 2023 as the study recorded a total number of arrivals of 2,590,970; 1,934,268 and 3,240,580 visitors in 2021, 2022 and 2023 respectively. The study also observed that 51% of the total recorded visitors to the area were from other States of Nigeria, 33% from other African countries and 16% from outside Africa. It was also observed that 4,605,243 utilized

accommodation facilities meaning that 68% of the visitors spent a night within the study location while 32% were day-time visitors. The study also revealed that 44% of the total number of visitors to the study locations attended cultural events, 29% patronized the drinking spots/ restaurants, 18% attended sport events, 9% visited the natural attractions within the study locations. It was also depict that 932 people representing 46% of the study population were involved in tourism related jobs while 1092 people representing 54% of the study population were involved in non-tourism related jobs. The study also observed that tourism attracted some benefits such as increasing family income and government revenue, employment and business opportunities, provision of basic and social infrastructures to improving aesthetics while the challenges ranged from increasing indiscriminate disposal of solid wastes, high rate of taxation and inflation rate, increasing cases of promiscuity and divorces to increase in crime rate and traffic congestion.

In summary, the study results confirm that the tourism industry had more positive impacts on the economy of people of Enugu State. This collaborates with the findings of Majebi & Amalu (2023); Sharma, Thomas & Justin (2021); Amalu, Phil-Eze & Ajake (2020); Majebi & Anieobi (2017) to elicit that the tourism industry has a significant influence on the economy of local people and host communities. Based on the findings of the study, the study recommends that government should make laws that will ensure that taxation is reduced and also collaborate with the private sector or private investors to establish more tourism investments and also maintain the existing ones.

REFERENCES

Adesina-Uthman, G. A., Majebi, E. C., Fagbolu , O. A. and Obaka, A. I.(2023): Analysis of Stakeholders Perceptions of the Impact of Crisis on Tourism in Ogun State, Nigeria. *International Journal of Tourism Business Research*, 2(2), 37–52.

Adenomon, M. O., and Maijamaa, B. (2020): On the Effects of COVID-19 outbreak on the Nigerian Stock Exchange performance: Evidence from GARCH Models.

Anderson, R. M., Heesterbeek, H., Klinkenberg, D., and Hollingsworth, T. D. (2020): How will country-based mitigation measures influence the course of the COVID-19. *The Lancet*, 395, (10228), 931–934.

Ajake, A. O., and Amalu, T. E. (2012a): Participation of Becheeve people in tourism development in Obudu Mountain resort, Cross River state, Nigeria. *British Journal of Humanities and Social Sciences*, 3 (2), 25– 39.

Ajake, A. O., and Amalu, T. E. (2012b): The relevance of tourism on the economic development of Cross River state, Nigeria. *Journal of Geography and Regional Planning*, 5(1), 11–25.

Ajake, A. O., Enang, I. A., Amalu, T. E., and Ojugbo, P. (2016): Assessment of cultural and museum landscapes for tourism development: The Calabar museum scenario, Cross River State, Nigeria. *Journal of Tourism and Management Research*, 1(1), 119–134.

Amalu, T. E., and Ajake, A. O. (2012): An assessment of the employment structure in the tourism industry of Obudu Mountain resort, Cross River state, Nigeria. *Geo-Journal of Tourism and Geosites*, 9(1), 35–56.

Amalu, T. E., and Ajake, A. O. (2014): Influence of Calabar carnival on the economy of residents of Calabar metropolis, Cross River state, Nigeria. *Global Journal*, 1(1), 67–81.

Amalu, T. E., and Ajake, A. O. (2015): The impact of hotel industry development in Enugu City, Nigeria. *Journal of Tourism and Heritage Studies*, 4(1&2), 106–120.

Amalu, T. E., Ajake, A. O., Oba, D., and Okpara, D. (2012): Assessment of the influence of education on tourism development in Enugu state, Nigeria. *American Journal of Tourism Research*, 1(1), 33–42.

Amalu, T. E., Ajake, A. O., and Obi, P. O. (2016): Impact of royalties from forest resources on community development in Boki Local Government in Cross River state, Nigeria. *GeoJournal*, 81(3), 475–487.

Amalu, T. E., Duluora, E. I., Otop, O. O., Omeje, V. U., and Emeana, S. K. (2017a): Assessment of tourists' patronage of Obudu mountain resort, Cross River state, Nigeria. *Journal of Hospitality and Management Tourism*, 8(4), 32–41.

Amalu, T. E., Otop, O. O., and Ojugbo, P. A. (2018a): Assessment of the impact of recreational resorts on the socio-economic growth of Calabar, Cross River State. *Sustainable Geoscience and Geotourism*, 1(1), 11– 24.

Amalu, T. E., Otop, O. O., Duluora, E. I., Omeje, V. U., and Emeana, S. K. (2017b). Socio-economic impacts of ecotourism attractions in Enugu State, Nigeria. *Geojournal: Spatially Integrated Social Sciences and Humanities*, 83(6), 1257–1269.

Amalu, T. E., Otop, O. O., Oko, U., and Oko-Isu, P. E. (2018b): Spatial distribution and patronage of Ecotourism attractions in Enugu State, Nigeria. Sustainable *Geoscience and Geotourism*, 2(1), 1–15.

Amalu, T. E., Ugwu, O., Idam, N. S., and Oko-Isu, P. E. (2019): Impacts of seasonality and patronage of lakes on the economy of host communities (a case of Nike Lake, Enugu Nigeria). *Journal of Travel, Tourism, and Recreation*, 1(1), 7–13.

Amalu, T., Phil-Eze, P. and Ajake, A. (2020). Assessing the impact of economic and cultural diversity on tourism development in Nigeria. *Geojournal*, Vol. 85 (5), 1457-1468.

Amalu, T. E., Oko, U., Igwe, I., Ehugbo, U., Okeh, B. and Duluora, E. (2021): Tourism industry effects on socio-cultural activities of host communities: Evidence from Cross River State, Nigeria, *Geojournal*, 86: 1691- 1703.

Bello, Y. O., and Majebi, E. C. (2018): Lodging Quality Index Approach: Exploring the Relationship Between Service Quality and Customer Satisfaction in Hotel Industry. *Journal of Tourism and Heritage Studies*, 7, (1), 58-78.

Bello, M.B. and Bello, Y.O. (2021): Consequences of covid-19 pandemic on hospitality industry: The Nigeria Experience. *International Journal of Research and Innovation in Social Science (IJRISS)*, Vol. 1(1), 422- 425, ISSN 2454-6186

Draper, C. J. and Dixon, A. W. (2020): Comparing resident and tourist preferences for public beach access and related amenities, *Ocean, and Coastal Management*, 53, (5&6), pp. 249-256.

Majebi, E.C and Amalu, T.E. (2023): Cultural tourism development in Enugu State, Nigeria: Evidence from the Pre and Post Covid-19 period. *Journal of Archaeology and Tourism* Research, Vol. 3(2), pp. 1-16.

FOTOSTOCK (2023): Stock Photo - Nigerian locals at tribal gathering cultural event at Enugu in Nigeria, West Africa.

Gold, J. R., and Gold, M. M. (2020): Festival cities: Culture, planning and urban life. Routledge.

Gossling, S., Scott, S., and Hall, C. M. (2020): Pandemic, tourism, and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism*, 1-20.

Gómez, L. A. E. (2021): Cultural tourism in cities post-COVID-19: A perspective and proposals for an alternative model. *Boletín de la Asociación de Geógrafos Españoles*, (91).

Greg, R. and Carlos, F. (2022): Cultural tourism during the Covid-19 pandemic in Portugal. *Tourism, Culture and Communication*, Vol. 2(3), 63-88.

Henseller, M., Maisonnave, H. and Maskaeva, A. (2022): Economic impacts of Covid-19 on the tourism sector in Tanzania. *Annals of Tourism Research Empirical Insights*, 3(1), 79-96.

Hernández-Mogollón, J. M., Duarte, P. A., and Folgado-Fernández, J. A. (2018). The contribution of cultural events to the formation of the cognitive and affective images of a tourist destination. *Journal of destination marketing & management*, *8*, 170-178.

Humphreys, M. H., and Plumber, J. A. (2015): The evil effects of carnival activities: The Caribbean experience. *International Journal of Tourism and Travels*, 106 (2), 176-185.

Iwara, E. E., and Amalu, T. E. (2017): Assessing the seasonal patterns of visitor's arrivals as an index for hotel industry growth in Calabar, Nigeria. *Journal of Tourism and Management Research*, 2(3), 135–146.

Li, X., Abbas, J., Dongling, W., Baig, N. U. A., and Zhang, R. (2022): From cultural tourism to social entrepreneurship: Role of social value creation for environmental sustainability. *Frontiers in Psychology*, 13, 925768.

Majebi, E. C., and Anierobi, C. (2017): Towards Harnessing the Potentials of the Rivers State Arts and Cultural Festival (CARNIRIV) for Tourism Development in Port-Harcourt, Nigeria. *Nigeria Journal of Management Research*, 11 (2), 37-50.

Richards, G., and King, B. (2022). The experience of cultural festivals: evidence from Hong Kong. *Journal of Policy Research in Tourism, Leisure, and Events*, *14*(3), 296-309.

Sharma, G.D., Thomas, A. and Justin, P. (2021): Reviving tourism industry post-Covid-19: A resilience based framework. *Tourism Management Perspectives*, 37 (3), 101-119.

Selemon, T. F, Chiranjib, K. C. and Alemken, B. M (2019): Ecotourism Potentials of the Majang Forest Biosphere Reserve. Gambella, Southwest Ethiopia. *International Journal of Tourism & Hospitality Reviews*: Vol. 6, No. 1: pp12-19.

Senbeto, D.L. (2022): Crisis and Africa's tourism industry: A Comprehensive review and agenda for future research. *Tourism Management Perspectives*, 43(3), 201-218.

Takon, T., and Amalu, T. E. (2013): Assessment of natural resource conservation in Boki Local Government area, Cross River state, Nigeria. *Environmental Science: An Indian Journal*, 8(4), 123–131.

Takon, T., Amalu, T. E., and Okpara, D. (2013): Assessment of local people's attitude towards natural resource conservation in Boki Local government area, Cross River state, Nigeria.

Research Journal in Organisational Psychology and Education Studies, 2(2), 60–66.

Todaro, J. I. (2015): Understanding tourism in Nigeria. JIS Printing Press. Ibadan: Bodija.

UNWTO (2022). UNWTO connects tourism and culture in Nigeria. Retrieved August 12, 2023. https://www.unwto.org/news/unwto-connects-tourism-and-culture-in-nigeria

UNWTO (2023). Tourism and COVID-19 – unprecedented economic impacts. Retrieved August 14, 2023.https://www.unwto.org/tourism-and-covid-19-unprecedented-economic-impacts

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

AGRICULTURAL PRACTICES AND FOOD INSECURITY IN ENUGU STATE, NIGERIA: CASE OF CASSAVA FARMERS IN EZEAGU LOCAL GOVERNMENT AREA

Amalu Titus Ejiofor
Department of Social Sciences, School of General Studies, Enugu State Polytechnic, Iwollo, Nigeria
Email: titiagento@gmail.com

ABSTRACT

Food insecurity is a contemporary and recurrent problem in Nigeria. This study focuses on the state of food availability and challenges facing cassava farmers in Ezeagu Local Government Area of Enugu State, Nigeria. Primary and secondary sources of data collection were elicited for the study. The study population comprises of six hundred household heads randomly selected across six communities (Iwollo, Olo, Aguobu-Owa, Amansiodo, Umumba, Obinofia) within Ezeagu Local Government Area. Results showed a reduction from 70% to 35% of the study population between 2021 to 2023 were involved in farming activities within the study area. The study also revealed that the major end products from cassava in the area were garri, fufu and abacha with a total income from sales of ₦15,011,890.00 in 2021, ₦11,139,194.00 in 2022 and ₦6,777,852.00 in 2023; which reveal a steady reduction in the derived financial benefits from the sales of cassava produce within the study area. The study result further reveals that the steady reduction in the number of farmers involvement and financial benefits from farming activities in the area were caused by activities of cattle rustling with 60%, kidnapping with 20%, communal conflicts and lack of storage facilities with 6% each, migration to cities and climate change with 3% each and inefficient agricultural practices with 2% response level. Based on the findings of the study, the study recommends that government should improve the security within the rural areas and enact laws that would discourage open grazing practices within the rural areas of the State.

Keywords: *Agricultural practices; cassava production, climate change, farming, food insecurity.*

1.0 INTRODUCTION

Agriculture continues to play a dominant role in economic and human development across the world and in Nigeria (Amalu and Onwudinjo, 2023). Agriculture remains the basis for industrial and economic revolution because apart from providing food for man, it supplies the raw materials used in the process of production (Igwe, 2023). Agriculture remains the foundation of man's development as it provides food which is one of man's basic needs that enhances life. Agricultural practices and development is so vital to the health and economic enhancement of people, countries and the world at large as any nation that produces enough to feed her citizenry and also export to other nations will have its agricultural sector contributing significantly to its gross domestic product (Onwudinjo et al., 2023). Conceptually, agriculture is the production of food, feed, fibre and other goods by the systematic growing and harvesting of plants and animals (Christiaensen et al., 2013; Enete, 2014; Christiaensen and Will, 2018). It is important to note that agriculture had been the major source of foreign exchange and economic strength of the Nigerian economy since independence in 1960 (IFAD, 2016; Steensland, 2020; Dorosh et al., 2020; Kawamura, 2021). The major highlight is the critical role agriculture has played in the provision of food for the sustenance of human life and provision of energies for creative and healthy growth (Enesi and Amalu, 2023). In this regards, there have been a high expectation that agriculture in Nigeria should perform the principal task of providing adequate and well balanced food supply for the growing population and also stand out as the major driver of the Nigerian economy (Amalu, 2016). It's worthy to emphasize that the need for agriculture to provide adequate food supply at reasonable cost goes beyond the farm sector if food supplies does not keep pace with the sector's demand for labour and the increasing population which have given rise to a corresponding increase in the demand for food, thus reducing the surplus for capital accumulation (Collier and Stefan, 2014).

Abraham Maslow had emphasized this when he put food as the most basic of human needs when he declared that food is central to man's development, hence its production at sustainable level must therefore be the pre-occupation of Governments in all nations (Yunfeng et al., 2022). In Nigeria, there have been several programmes for food production namely, National Accelerated Food Production Programme (NAFPP), Operation Feed the Nation (OFN), Green Revolution, Back to Land Programme, Directorate of Food, Roads and Rural Infrastructure (DFRRI), Family Support Programme (FSP). Unfortunately, these programmes have not been successful in spite of the enormous prospects such as vast land area for agricultural development in Nigeria and have been attributed to the rapidly increasing number of Nigerians living in poverty representing about 67% of the entire population (UN DESA, 2021).

It worthy of note that almost 70% of the Nigerian population engage in agriculture sector mainly at a subsistence level and between January 2022 and March 2023, the agriculture sector contributed to 22.3% of the total Gross Domestic Product (Amalu and Onwudinjo, 2023). Despite the contribution to the economy, Nigeria's agricultural sector faces many challenges which impact on its productivity. These include; poor land tenure system, low level of irrigation farming, climate change, land degradation, low technology, high production cost and poor distribution of inputs, limited financing, high post-harvest losses and poor access to markets. Others are insecurity, banditry, kidnapping, cattle rustling and communal crisis (Asada, 2020; Amalu and Onwudinjo, 2023).

These challenges have stifled agricultural productivity affecting the sector's contribution to the country's GDP as well as increased food imports due to population rise hence declining levels of food sufficiency. Between 2018 and 2023 Nigeria's cumulative agricultural imports stood at N3.35 trillion, four times higher than the agricultural export of N803 billion within the same period (USDA, 2024).

In recent times, in a bid to enhance the Nigerian agricultural sector, the Government has implemented several initiatives and programmes to address the situation including the Agriculture Promotion Policy (APP), Nigeria-Africa Trade and Investment Promotion Programme, Presidential Economic Diversification Initiative, Economic and Export Promotion Incentives and the Zero Reject Initiative, Reducing Emission from Deforestation and Forest Degradation (REDD+); Nigeria Erosion and Watershed Management Project (NEWMAP); Action Against Desertification (AAD) Programme, among others (World Bank, 2016).

All these efforts aim to increase agricultural productivity in order to provide sufficient quantities of food to meet domestic demand as well as an abundance of commodity crops for export in the international market. Besides, they aim at reversing forest loss and degradation; promoting sustainable management of natural resources; rehabilitation of degraded lands and reducing erosion and climate vulnerability (Otsuka and Shenggen, 2020).

Agricultural activities in Enugu State, Nigeria have been an issue of great concern with the available fertile land for agriculture but decreasing yield and output as years pass-by (Ariya et al., 2016; Abdullahi, 2019), unfortunately, in recent times, there have been rising cases of cattle rustling and prevalence of insecurity indicators such as kidnapping, arm robbery, rape, assassination, communal crisis which have led to huge restrictions in economic activities and apathy towards agriculture (Oduchie et al., 2023). It is in this forgoing that this study seeks to examine the prevalence of agricultural activities towards the production of cassava in Ezeagu Local Government Area of Enugu State, Nigeria.

.

2.0 METHODOLOGY

Enugu State is located on the Northwestern fringe of southeastern Nigeria between latitudes 6°30N and 7°10N and longitudes 6°35E and 7°30°E. It is located in the plains exceeding 200 metres above mean sea level and high lands, which is part of Nsukka-Udi-Okigwe Cuesta. Enugu State has an estimated population of about 101,671 million people (Amalu and Onwudinjo, 2023). The land area is approximately 16,727 square km. The soil type is mostly hydromorphic, which is heavy and composed of silt and clay (Amalu and Enesi, 2023).

The study purposively selected six communities within Ezeagu Local Government Area, Enugu State, Nigeria. The choice was based on the predominance of economic and agricultural activities within the area. The study adopted both primary and secondary sources of data collection methods to elicit information for the study. The primary source involved the use of questionnaire survey and interview sessions while the secondary source involved the use of year books, annual reports, articles and journals from government and private agricultural based institutions and the internet. Interview sessions were held with at least two key informants (the traditional ruler, chiefs and the town union leaders from communities across the four selected communities. Data for the study were collected using structured questionnaires and interview sessions with a multi-stage sampling procedure involving purposive and random sampling techniques to select a sample size. A total number of 150 respondents were selected comprising 120 household heads and 30 key informants from six communities in Ezeagu Local Government Area (Table 1).

Table 1: Population size of the study

Communities	No. of household heads	No. of key informants	Total
Iwollo	20	5	25
Olo	20	5	25
Aguobu-Owa	20	5	25
Amansiodo	20	5	25
Umumba	20	5	25
Obinofia	20	5	25
Total	120	30	150

Source: Researcher's field survey, 2023

The study derived the following information for consideration; information on the occupational characteristics of the farmers of the study area, yield of cassava between 2021 and 2023, income from agricultural produce within the study area. Data collected for the study were presented using tables, charts, graphs and analyzed with descriptive statistical techniques such as simple percentages and mean scores.

3.0 RESULT AND DISCUSSION

Information on table 2 shows the occupational characteristics of the people of the study area. The table revealed that in 2021, there were 422 farmers representing 70% of the entire workforce in the area. In 2022, the number of farmers reduced to 307 farmers representing 51% of the total workforce while in 2023, the number further reduced to 216 farmers representing 36% of the entire workforce indicating that, there are factors that are affecting the development of agriculture in the area. The number of traders increased from 102 traders representing 17% of the entire workforce in 2021, to 178 traders representing 30% workforce in 2022 and 242 traders representing 40% of the entire workforce in 2023. This showed that the people of the study area were predominantly farmers but in recent times, they have moved on to other means of livelihood.

Table 2: Occupational Characteristics of the Study Population (2021-2023)

Communities	2021			2022			2023			Total
	Artisan	Trader	Farmer	Artisan	Trader	Farmer	Artisan	Trader	Farmer	
Iwollo	17	22	61	28	40	32	26	58	16	300
Olo	12	18	70	18	29	53	23	36	41	300
Aguobu Owa	19	24	57	27	34	39	32	46	22	300
Amansiodo	6	8	86	12	19	69	17	31	52	300
Umumba	12	16	72	16	24	60	24	30	46	300
Obunofia	10	14	76	14	32	54	20	41	39	300
Total	76	102	422	115	178	307	142	242	216	1800
(%)	13	17	70	19	30	51	24	40	36	100

Source: Researcher's field survey, 2024

Information on table 3 clearly revealed the behavior of farmers in recent times in the study area. The table revealed that more farming activities took place in Amansiodo with a total of 207 farmers representing 22% of the entire farmers in the study area, followed by Umumba with 178 farmers representing 19% of the farmers and Obinofia with 169 farmers representing 18% of the farmers while the least farming activities were experienced in Aguobu Owa and Iwollo communities with 118 and 109 farmers representing 12% of the entire farmer population in the area respectively.

Table 3: Characteristics of farmers within the study area

Communities	2021	2022	2023	Total	(%)
Iwollo	61	32	16	109	12
Olo	70	53	41	164	17
Aguobu Owa	57	39	22	118	12
Amansiodo	86	69	52	207	22
Umumba	72	60	46	178	19
Obinofia	76	54	39	169	18
Total	422	307	216	945	100
(%)	45	32	23	100	

Source: Researcher's field survey, 2024

Information on table 4 showed the cassava yield by farmers within the study area between 2021 and 2023. The table revealed that a total of 792,044 tons of cassava were harvested in 2021, while 584,420 tons of cassava was harvested in 2022 and 445,622 tons of cassava was harvested in 2023. This showed a steady reduction in the amount of cassava harvested in the study area from 2021(44%) to 2023 (24%).

Table 4: Farm yield for cassava farmers in the study area (2021-2023)

Community/Yield	Cassava yield in tons			
	2021	2022	2023	Total
Iwollo	130,200	102,002	78,100	310,302
Olo	126,200	99,100	82,020	307,320
Aguobu Owa	131,722	89,271	69,320	290,313
Amansiodo	112,520	90,261	72,880	275,661
Umumba	122,621	103,026	74,102	299,749
Obinofia	168,781	100,760	69,200	338,741
Total	792,044	584,420	445,622	1,822,086
(%)	44	32	24	100

Source: Researcher's field survey, 2024

The study further assessed the utility of cassava in the area with information on table 5 showing that cassava was used to produce garri, fufu and abacha. The table further revealed that a total of ₦15,011,890.00 was derived from the sales of cassava products in 2021, reducing to ₦11,139,194.00 in 2022 while in 2023, the income from cassava products reduced to ₦6,777,852.00. Information on Figure 1 also showed the rate of utilization of cassava products, revealing that 49% of the entire cassava production was used to produce garri, 33% was used to produce fufu while 18% was used to produce abacha in the study area. This showed that the people of the study area preferred to use cassava to produce garri.

Table 5: Income from sales of cassava by farmer in the study area (2021-2023)

Community	Income from cassava products in Naira (₦)								
	2021			2022			2023		
Products	Garri	Fufu	Abacha	Garri	Fufu	Abacha	Garri	Fufu	Abacha
Iwollo	1,321,320	960,260	411,300	960,271	751,321	201,691	620,310	551,020	98,021
Olo	1,220,680	920,760	421,010	876,221	802,660	302,020	586,910	502,760	90,021
Aguobu Owa	980,890	901,310	632,110	730,600	761,500	602,720	602,500	432,200	122,110
Amansiodo	1,294,400	898,460	510,780	990,890	689,650	432,750	650,280	491,800	202,600
Umumba	1,290,730	601,500	472,800	920,680	362,980	302,520	430,200	281,700	202,580
Obunofia	1,198,270	586,210	389,100	862,420	302,620	285,680	512,600	201,600	198,640
Total	7,306,290	4,868,500	2,837,100	5,341,082	3,670,731	2,127,381	3,402,800	2,461,080	913,972
Grand total	15,011,890			11,139,194			6,777,852		

Source: Researcher's field survey, 2024

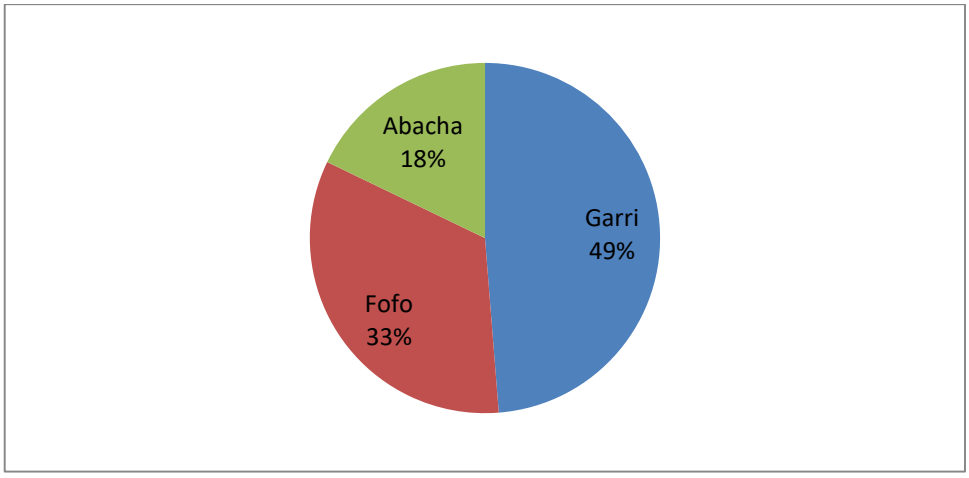
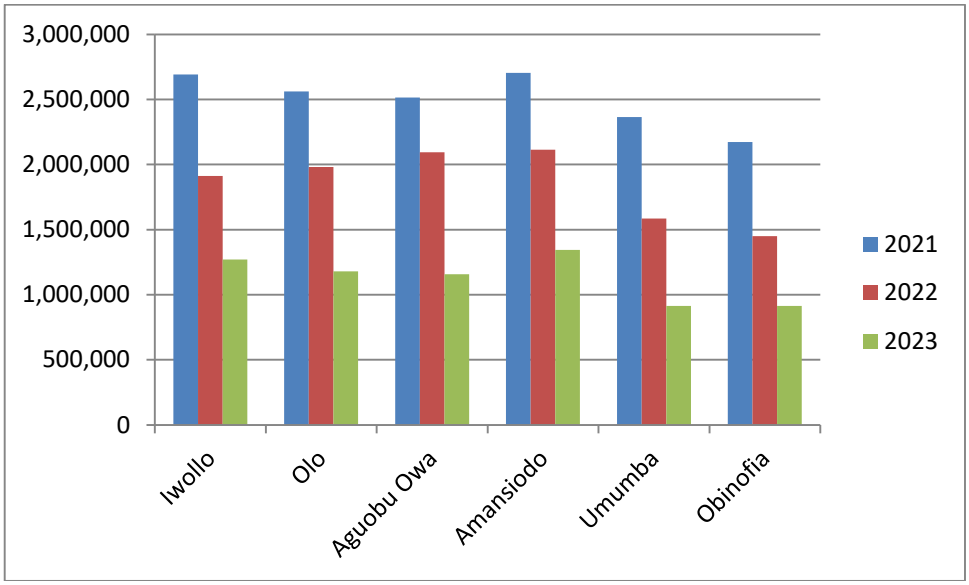


Figure 1: Utilization of cassava product in the study location

Source: researcher's field survey, 2024

Information on figure 2 showed the pattern of income generation from cassava product between 2021 and 2023 across the study locations. The income/revenue from cassava products had a steady decrease from 46% in 2021, to 34% in 2022 and 20% in 2023.



Source: Researcher's field survey, 2024
Figure 2: Income differentials for cassava products in the study area (2021-2023)

The study also examined the factors affecting the growth of the agricultural sector in the study area. Information on table 6 revealed that cattle rustling were observed to be the highest challenge of agriculture in the area with 253 (60%) responses, followed by kidnapping with 84 responses (20%), communal conflicts and lack of storage facilities with 25 (6%) responses respectively.

Table 6: Challenges of agriculture in the study area

Challenges of agriculture	Responses	(%)
Change in climate	13	3
Communal conflict	25	6
Lack of storage facilities	25	6
Migration to cities	13	3
Type of agricultural practices	9	2
Cattle rustling	253	60
Kidnapping	84	20
Total	442	100

Source: researcher's field survey, 2024

4.0 CONCLUSION

The study examined the agricultural practices in Ezeagu Local Government Area of Enugu State, with specific interest on cassava production. The study revealed that the people of Ezeagu Local Government area were predominantly farmers and that there has been a steady decrease in the number of farmers and this had a corresponding effect on yield and income from cassava products within the study area. The study further revealed that the decrease in the peoples participation in agricultural activities was due to factors such as uncontrolled cattle rustling, kidnapping, communal conflicts, migration to cities for greener pasture, climate change and lack of storage facilities in the area. The people were observed to gradually withdraw their interest for agricultural activities and were more involved in trading and other means of livelihood for survival because of the life-threatening challenges of insecurity in the study area. This study therefore recommends that government and other stakeholders should collaborate to ensure that adequate measures are put in place to improve the security situation in the area while necessary actions are taken to stop or reduce the activities of cattle rustling within the rural communities.

REFERENCES

Amalu, T.E. (2016): Socio-economic implication of ecotourism attraction in Enugu State, Nigeria. *Oghe Writers Association Journal*, Vol. 1(4), pp. 58-77.

Amalu, T.E., & Onwudinjo, L.E. (2023): Agriculture and rural economic development: Evidence from Enugu State, Nigeria. *Espoly Journal of Functional Education*, Vol. 1(1), pp. 9-23.

Igwe, J.A. (2023): Cultivation of cassava to prevent hunger and poverty in Enugu north local government area of Enugu State. *Espoly Journal of Functional Education*, Vol. 1(2), pp. 17-23.

Onwudinjo, L.E., Ugwoke, J.C., Amalu, T.E., & Ilo, W.N. (2023): Economics and environment of yellow pepper production using poultry manure and fertilizers in Uzo-Uwani area of Enugu State, Nigeria. *Espoly Journal of Functional Education*, Vol. 1(2), pp. 7-16.

Enete, I.C. (2014): Impacts of climate change on agricultural production in Enugu State, Nigeria. *Journal of Earth Science and Climate Change*, 5:234.

Enesi, C.M., & Amalu, T.E. (2023): Cultural tourism development in Enugu State, Nigeria: Evidence from the pre- and post-COVID-19 period. *Journal of Archaeology and Tourism Research*, Vol. 3(2), pp. 1-16.

Chiaka, J.C., Zhen, L., Yunfeng, H., Xiao, Y., Muhirwa, F., & Lang, T. (2022): Smallholder farmers' contribution to food production in Nigeria. *Frontier Nutrition*, 9:916-928

Asada, R. (2020): Growth with rural development: Sri Lanka's serendipitous contribution in an age of SDGs. Background paper for *World Social Report 2021*, December.

Christiaensen, L., & Will, M. (2018): Agriculture, structural transformation, and poverty reduction: Eight new insights. *World Development*, Vol. 109, September.

Christiaensen, L., Joachim, D.W., & Yasuyuki, T. (2013): Urbanization and poverty reduction: The role of rural diversification and secondary towns. *Policy Research Working Papers*, Vol. 6422, April.

Collier, P., & Stefan, D. (2014): African agriculture in 50 years: Smallholders in a rapidly changing world? *World Development*, Vol. 63, November.

Demirgüç-Kunt, A. (2018): The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution. Washington, DC: *World Bank*, April.

Dorosh, P., & Thurlow, J. (2018): Beyond agriculture versus non-agriculture: Decomposing sectoral growth–poverty linkages in five African countries. *World Development*, Vol. 109, September.

Estudillo, J.P., & Keijiro, O. (2018): Moving out of poverty: An inquiry into inclusive growth in Asia. *Routledge*.

Gollin, D. (2010): Agricultural productivity and economic growth. *Handbook of Agricultural Economics*, Elsevier, pp. 3825–3866.

IFAD (2016): Rural development report 2016: Fostering inclusive rural transformation. Rome: *International Fund for Agricultural Development*.

Ivanic, M., & Will, M. (2018): Sectoral productivity growth and poverty reduction: National and global impacts. *World Development*, Vol. 109, September.

Kawamura, H. (2021): In situ urbanization key to leaving no one behind. *UN DESA Policy Brief*, No. 104, May. New York: *United Nations Department of Economic and Social Affairs*.

Khalil, C.A. (2017): Defining small-scale food producers to monitor Target 2.3 of the 2030 Agenda for Sustainable Development. *FAO Working Paper Series*, No. ESS/17-12, June.

Otsuka, K., & Shenggen, F. (2020): Agricultural development: New perspectives in a changing world. Washington, D.C.: *International Food Policy Research Institute*.

Steensland, A. (2020): 2020 Global Agricultural Productivity Report: Productivity in a time of pandemics. Ed. Tom Thompson, Virginia Tech College of Agriculture and Life Sciences.

Thurlow, J., Danielle, R., & Dumebi, U. (2015): Matching concepts with measurement: Who belongs to Africa's middle class? *Journal of International Development*, Vol. 27, No. 5, July.

UN DESA (2021): World Social Report 2021: Reconsidering rural development. New York: *United Nations Department of Economic and Social Affairs*.

USDA, Economic Research Service (2019): International agricultural productivity.

World Bank (2016): World Development Report 2016: Digital Dividends, January.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

FINANCIAL SYSTEM DEVELOPMENT AND ECONOMIC GROWTH: GRANGER-CAUSALITY EVIDENCE FROM NIGERIA

Onwudinjo Louis Ejike
Department of Agricultural Extension and Management
Enugu State Polytechnic, Iwollo, Enugu State Nigeria.
ejikonomics@yahoo.com

ABSTRACT

This study examined the nexus between financial system development and economic growth in Nigeria between 1970 and 2021. Vector Autoregressive (VAR) model was used. The main objective of the study is to ascertain the relationship between the financial development and economic growth in Nigeria. The study made use of secondary data sourced from Central Bank of Nigeria Statistical Bulletin and Annual Reports 2021. Eight variables were used. These are, real gross domestic product (GDP), credit to private sector as a ratio of GDP, loan to deposit ratio, total banking saving, total savings as a ratio of GDP, total loans and advancement, banking credit as a ratio of GDP and interest rate spread. In line with the objectives of the study, the Granger-Causality tests result showed a causal relationship moving from economic growth to some of the financial development variables and vice versa. Specifically, the result showed that total loan and advances and total saving granger causes real GDP without a feedback effect. This finding tends to support the view that in emerging market economies which have a less sophisticated financial system, economic growth induces financial development and vice versa. Furthermore, all the financial development variables showed a positive sign, meaning that there is a positive relationship between economic growth and financial sector development in Nigeria. Thus, macroeconomic policy mix of monetary and fiscal policies alongside the advancement in the financial sector which includes diversification of financial instruments should be pursued aggressively to sustain economic growth in Nigeria.

Key words: *Granger-Causality; Financial system Development; Economic Growth; Financial Instruments*

1.0 INTRODUCTION.

The history of finance is one of the most innovative and exiting parts of economics. However, many of the world's major economic traumas of the twentieth and twenty-first centuries can be traced to mismanaged financial system. The financial system is an important component of any economy and plays a crucial role in the generation of economic growth and development. Nwaoba (2009) opines that "the traditional function of the financial system is financial intermediation, as it is the financial system that moves the economy's scarce resources from savers to borrowers". Thus, "a well developed financial system enhances investment by identifying and funding good business opportunities, mobilizing savings, encouraging trading, hedging and diversification of the risk, and facilitates the exchange of goods and services. These functions result in a more efficient allocation of resources, rapid accumulation of physical and human capital, and faster technological progress, which in turn results in economic growth" (Ukeje and Akpan, 2007).

Modern financial system came to Nigeria in the 19th century, largely following trade and commerce, imports and exports activities between Nigeria and the Western countries. 'But in the last sixty years, it moved to the direction of financing domestic activities, thus playing a major role in the economic growth and development of Nigeria, (Tella, 2004). The World Bank (2009) also stressed that "a financial system development channelled towards the economy, would engender growth and productivity in Nigeria. Financial development entails the creation and expansion of financial institutions, instruments and markets that support investments and growth process". Following the above assertions, financial development happens when financial institutions effectively generate financial resources for other development activities.

Efforts to introduce this in Nigeria resulted in various reforms in Nigerian financial sector. Financial reform in Nigeria dates back to 1952 when the Banking Ordinance was enacted. "The 1986 reform of the financial system saw a policy shift from direct control to a market based financial system, especially as regards monetary management, risk management and asset holding capabilities of the institutions. Since 1987, financial sector reforms have been implemented, encompassing elements of liberalisation and measures to enhance prudential regulation and tackle bank distress" (Adeoye, 2007).

Nigeria has a relatively modern and sophisticated financial structure in terms of institutional mix and the range of instruments availability. For instance, 'the total asset owned by Nigerian deposit money banks (DMBs)

as at 1960 was ₦235.8m, but it rose to N87.25 trillion in the first quarter ended March 31, 2023, up by 17.8 % from N74.07 trillion in the corresponding period in 2022' (CBN, 2023). Today, forty-three licensed DMBs are authorised to operate in Nigeria as at 26 April, 2024.

However this notwithstanding, some scholars had opined that the financial systems in Sub-Saharan African are not yet developed. For instance, Gelbard and Leite (1999) and Ncube (2007), maintained that "the regional financial sectors suffer from various unfavourable characteristics and these characteristics include poor financial innovation, wide interest rate spreads, weak legal systems, poor institutional environments and pronounced market fragmentation. In addition, the level of financial depth and efficiency is rather low when compared with the developed world regions". According to Sanusi (2012), 'the Nigerian financial system is still less integrated with the global financial market, as it still operates with simple financial products'. Another relevant issue that affect Nigerian financial system development relates to the geographical dispersion of bank offices and the easy availability of banking services to the majority of the population. "As at December 2012, there were 24 DMBs with 5,797 branches, signifying one bank branch network for every 28,808 Nigerian. That was very far when compared with the CBN target of 10.000 Nigerians to a bank branch. That also indicates a high level of financial exclusion when compared with other countries" (Sanusi, 2012). For instance, 'as at 1986, the United States of America has a bank branch for every 12,000 Americans' (Ekehund and Tollison, 1986), while 'Trinidad and Tobago has a bank branch to every 10,000 persons as at November, 2001' (Sergeant, 2001).

The degree of financial exclusion in Nigeria was "further substantiated by the 2010 Enhancing Financial Innovation and Access (EFInA) survey, which observed that 46.3% of adult Nigeria's population were still financially excluded compared to South Africa, Kenya, and Botswana with 26.0%, 32.7% and 33.0%, respectively" (EFInA, 2010). Further analysis on the financially excluded population in Nigeria revealed that "54.4% were women, 73.8% were younger than 45 years, and 34.0 percent had no formal education, while 80.4% resides in rural area" (Sanusi, 2012). All these made Akinboyo (2007) to argue that "in Nigeria, the formal financial system provides service to about 35% of the economically active population while the remaining 65% are excluded from access to financial services". Again, there exists wide gap between the deposit rates and prime lending rates in the banking system in Nigeria. For instance, "the average lending rate of deposit money banks rose to 24.6% in December 2012 from 23.21% in December 2011, while the average deposit rate was 3.77% in December 2012; thus widening the gap between the maximum lending and deposit rates to 20.84 from 20.12% in the review period" (CBN, 2013).

Hence, whether the financial sector in Nigeria actually aid growth in the country is not yet certain. Some studies like Ndebbio (2004) and Ghirmay (2004) found "that financial sectors have enhanced economic growth in the past by positively influencing the levels of investment or capital accumulation". But, Adeoye (2009) indicated "that the impact of financial development on growth has been rather negligible". In Nigeria, the results on this issue had been mixed and inconclusive. Onwuiduokit and Adamu (2005) examined the indicators of financial depth and "found that interest rate spread, broad money/GDP, and loan deposit worsen during reform periods, compared to the control period". This study is an attempt to empirically examine the financial development and economic growth nexus in Nigeria. It attempts to provide empirically the answers to the following question. What is the causal relationship between financial deepening and economic growth in Nigeria? The main objective of this study is therefore to empirically examine the interactions and feedback mechanism between financial sector development and economic growth in Nigeria by evaluating the ground covered so far on the theoretical and empirical front and points to still unresolved issues, a gap which it intends to fill.

2.0 THEORIES ON FINANCIAL DEVELOPMENT

2.1 McKinnon and Shaw Theory.

McKinnon (1973) and Shaw (1973) "highlight the adverse effects of financial repression on economic development. Financial repression refers to the distortion of domestic financial markets through measures such as ceiling of interest rates and credit expansion, selective allocation of credit, and high reserve requirements. Such misguided policies have damaged the economies of many developing countries by reducing savings and encouraging investment in inefficient and unproductive activities". Shaw (1973) emphasised on the development of the financial system in any economy. He argued that it is only when there is a repressive financial system that the financial sector will become ineffective and inefficient.

In his article, Shaw (1973) said "that the financial sector matters a lot to the growth of the real sector in any economy". This sector can assist in breaking out from plodding repetition of a repressed economic performance of accelerated growth. According to Shaw (1973), "shallow financing, which distort financial prices (including interest rate) has led to a plummeted real rate of growth and the real size of financial system. And thus, financial system by discouraging and not stimulating the

level of savings leads to inadequate or low amount of mobilized savings, which invariably has to be rationed in an inefficient manner".

For McKinnon and Shaw (1973), "the effect of financial reforms is to free the financial markets from excessive government regulation in order to foster a free market-based system of mobilizing savings and the allocation of credits to the private sector. It is expected to enhance the development an efficient financial sector with an effective banking sector at its core. Successive financial sector reforms should promote competition in the banking sector. Furthermore, the removal of controls on interest rate and credit ceilings can be expected to greatly enhance the efficiency of financial intermediation by channelling credits to high yielding investment opportunities".

2.2. Demand-Following Theory.

The Demand-Following Hypothesis propounded by Patrick Hugh in 1966 who posits that the growth level of an economy generates or induces additional demand for financial services. According to Patrick (1966), this hypothesis not only "suggests but advocates a demand-following relationship between finance and economic development". The overriding tenet of this theory is that demand creates its own supply with financial development viewed as accommodating and reacting positively to an economy's performance.

Patrick (1966) referred to demand-following as the "basic phenomenon in which the general creation of contemporary or modern financial assets, financial liabilities and other links or known financial services are in response to the demand for the services by those ready to invest in the economy. This means that rapid and sudden economic growth leads to the demand for modern financial institutions, their assets, services, liabilities and arrangement by both investors and savers. Thus, the evolutionary development and changes of the financial system is a continuing consequence of pervasive, sweeping process of economic development".

It should be made known that the demand-following finance calls for the need for development in the real sector to precede the formation of credits (loans). It also means suggest that it should be economic development before finance. According to Patrick (1966), "the rate of demand for financial services is a function of growth in real output, commercialization and monetization of agriculture cum other traditionally known subsistence sectors". Thus, the demand for financial intermediation depends on real output growth rate and upon the commercialization of the real productive sector of an economy.

According to the advocates of this theory, "economic growth is seen and believed to be prerequisite for financial development, because, as the real productive sectors experience growth, the increasing demand for financial services is directly going to stimulate growth in the financial sector" (Gurley and Shaw, 1967). The major critic of this theory is that it undermines the role financial intermediation plays in creating and providing reliable payment services, mobilization of savings and its ability to allocate credits to various sectors of the economy.

2.3 Supply-Leading Theory.

This Supply-Leading Theory which was developed by Patrick Hugh Institution in 1963 can also be referred to as a Financial-Lead Hypothesis. This theory stipulates that there should be available and existence of functional financial systems, and they must have attain its advance state before there can be demand for their services. Thus, a leading role is assigned to financial institutions which need to be created before the demand for their facilities really becomes evident. Such financial institutions are usually seen as playing a catalytic role in the real sector development in the economy. A good example is the financial development experience of Germany since 1870. More so, the financial intermediation structure would be seen as having features opposite to those of the demanding following. This will make resource allocation "from the surplus spending units to the deficit units to be done efficiently, thereby, leading other economic sectors in their growth process" (Patrick, 1966). Two main functions are known to be performed by this Supply-Leading phenomenon: first, it deals with the transfer of resources from non- growth (traditional) sector to modern sector; second, it stimulates and promotes an entrepreneurial response in the modern sector. Also, this supply leading process of financial intermediation can be compared to the term "innovation financing" (Schumpeter, 1911).

The belief of the proponent of this hypothesis is that the financial sector/institutions and their activities act as a cardinal tool that increases the productive efficiency in countries and make their economies grow faster. They believe that economies with well-developed financial system or sector will always grow faster. Economists like Schumpeter (1911) did strongly affirm and supported the assertion that there "is a functional and causal correlation between finance and economic growth in any economy". Empirical evidence has also led so many researchers to support to support this assertion.

3.0 EMPIRICAL LITERATURE.

Several researchers have examined the relationship between financial sector development and economic growth and development. Rousseau and Wachtel (2009) studied the contributions of financial development on economy of South America from 1960 to 1999; and

found out that 'financial crises in the region dampened its development on the economy'. They also observed that 'the high level of financial depth might have followed the liberalization policies embraced by some countries in the region that were deficient in the legal framework to drive efficient financial development'. In Asia, the empirical studies on finance-growth nexus revealed a conflicting result. Aziz and Duenwald (2002) employed banks credits and measured the financial depth in Chinese provinces and discovered "a negative relationship between financial development proxied by bank and the regional economic growth". But, Hao (2006) results indicated a positive relationship; nevertheless, further explanation showed that credits allocated by banks then in China was still preferable than pre reforms state budgets. Relying on 1983 to 1997 data, Liu and Shu (2002) found that Chinese banks and economic growth influence one another; while Liang and Teng (2006) employed causality and investigated banks and growth causality in China and found one way causality'.

Onwioduokit (2007) empirically studied the "financial sector development and economic growth in Nigeria. Finding tends to corroborate the fact that, in developing market economics, which has a less sophisticated financial system, there is a predominant demand following relationship, where financial development induces economic growth". Alayande (2007) also studied financial sector liberalization and its effect on Nigerian economy from 1970 and 2004 using quarterly data. The methodology employed includes test for stationary, tests for co-integration. The econometric results show that financial liberalization is one of the determinants of economic growth in Nigeria. The study suggests that more loanable funds should be channelled into productive ventures to further enhance growth. Ogege and Shiro (2012) empirically studied the role of DMBs in Nigerian economy from 1974 to 2010. The study was based on time series econometric analysis. The study observed a positive relationship.

This paper will employed the structural var (SVAR) model which incorporated the error-correction term from the co-integration equation to capture the causal relationship between financial development and economic growth in Nigeria.

4.0 METHODOLOGY

The model used for the study followed a Structural Vector Autoregressive (SVAR) model. The SVAR model developed by Sims (1980) is one of the approaches to forecasting in time series data and is most useful in dealing with multiple–equation system or simultaneous structural models. In such models, some variables are treated as endogenous and some as exogenous. Essentially, a SVAR model is a multi-equation autoregressive model in which each variable is considered endogenous following Sims' (1980) formulation (Udoh, 2009).

4.1 The Model Specification.

Following McKinnon and Shaw financial repression hypothesis, demand - following and supply-leading hypotheses, a model showing the relationship between financial development index and economic growth was developed. Therefore, this study specified a Structural Vector Autoregressive (SVAR) model (also called 'primitive system') with the following endogenous variables: real GDP (RGDP); banking credit as a ratio of GDP (BC/GDP); credit to private sector as a ratio of GDP (CPS/GDP); loans to deposit ratio (LDR); total loans and advancement (TLA); total savings (TS); total savings as a ratio of GDP (TS/GDP) and a control variable: interest rate spread (IRS). Recall the objective of this study is to empirically examine the direction of causality between financial development and economic growth in Nigeria. The SVAR model is specified in a format, where each of the endogenous variables depends on its lagged value, current and lagged values of the other variables and on an independent and identical (iid) error term as follows:

$$RGDP_{i,t} = \delta_{10} + \delta_{11}TS_{i,t} + \delta_{12}TLA_{i,t} + \delta_{13}CPS/GDP_{i,t} + \delta_{14}TS/GDP_{i,t} + \delta_{15}LDR_{i,t} + \delta_{16}IRS_{i,t} + \delta_{17}BC/GDP_{i,t} + \alpha_{11}RGDP_{i,t-k} + \alpha_{12}TS_{i,t-k} + \ldots + \alpha_{18}BC/GDP_{i,t-k} + \varepsilon_{1,t}$$

$$TS_{i,t} = \delta_{20} + \delta_{21}RGDP_{i,t} + \delta_{22}TLA_{i,t} + \delta_{23}CPS/GDP_{i,t} + \delta_{24}TS/GDP_{i,t} + \delta_{25}LDR_{i,t} + \delta_{26}IRS_{i,t} + \delta_{27}BC/GDP_{i,t} + \alpha_{21}RGDP_{i,t-k} + \alpha_{12}TS_{i,t-k} + \ldots + \alpha_{18}BC/GDP_{i,t-i} + \varepsilon_{2,t}$$

.

.

.

$$BC/GDP_{i,t} = \delta_{80} + \delta_{81}TS_{i,t} + \delta_{82}TLA_{i,t} + \delta_{83}CPS/GDP_{i,t} + \delta_{84}TS/GDP_{i,t} + \delta_{85}LDR_{i,t} + \delta_{86}IRS_{i,t} + \delta_{87}RGDP_{i,t} + \alpha_{81}RGDP_{i,t-k} + \alpha_{82}TS_{i,t-k} + \ldots + \alpha_{88}BC/GDP_{i,t-k} + \varepsilon_{8,t}$$

Where: RGDP = real GDP; BC/GDP = banking credit as a ratio of GDP; CPS/GDP = credit to private sector as a ratio of GDP; LDR = loans to deposit ratio; TLA = total loans and advancement; TS = total banking savings, and TS/GDP = total savings as a ratio of GDP. IRS = interest rate spread, measured as the difference between saving and prime lending rate;

t = 1, . . ., T. t-k = the lag criteria order (k = 1, 2, …, j) ε = independent and identical (iid) stochastic error terms. Note that TS, TLA, CPS/GDP, TS/GDP, LDR, and BC/GDP are financial development variables; while the IRS is the control variable.

5.0 INTERPRETATION OF EMPIRICAL RESULTS

This section begins with the analysis of data generating process; the descriptive, correlation, unit root (stationary structure) and co-integration statistics of the data series. These processes will enable the researcher to carry out some predetermine operations, where applicable, on the variables, so as to have a more précised analysis. The data used for this estimation, was obtained from the CBN Statistical Bulletin 2015 version.

5.1: Descriptive Statistics.

Thus, the descriptive statistic and correlation matrix emanating from these variables are presented in table 5.1 and 5.2 below. The probability in the descriptive statistic shows that most of the variables are not normally distributed, showing high values of standard deviation, Jarque-Bera statistics and zero probability. The only variable showing slightly to be normally distributed is the loans-to-deposit ratio (LDR), with Jarque-Bera statistics being less than 2, in line with a rule of thumb (see table 5.1) below.

TABLE 5.1: Descriptive Statistics.

	BC_GDP	CPS_GDP	TS	TS_GDP	IRS	LDR	RGDP	TLA
Mean	5894.455	11.52114	736756.3	11.44477	-8.100000	66.15682	15741.05	542066.5
Median	86.95000	10.50000	26726.25	10.34000	-7.100000	67.55000	6804.385	16616.75
Maximum	119806.1	36.70000	6531913.	23.25000	0.300000	85.70000	80222.13	7799400.
Minimum	-565.2000	4.780000	411.8000	4.980000	-20.70000	42.90000	94.33000	351.5000
Std. Dev.	22859.42	5.956849	1659625.	4.473865	5.904078	11.66026	20648.38	1425049.
Skewness	3.975173	2.383496	2.573193	0.770071	-0.305236	-0.270775	1.628885	3.801671
Kurtosis	18.01474	9.617847	8.349129	2.638744	1.627548	2.185241	4.837087	18.06155
Jarque-Bera	529.1925	121.9536	101.0139	4.587992	4.136550	1.754700	25.64458	521.8786
Probability	0.000000	0.000000	0.000000	0.100863	0.126404	0.415884	0.000003	0.000000
Sum	259356.0	506.9300	32417279	503.5700	-356.4000	2910.900	692606.3	23850926
Sum Sq. Dev.	2.25E+10	1525.814	1.18E+14	860.6651	1498.900	5846.348	1.83E+10	8.73E+13
Observations	44	44	44	44	44	44	44	44

Source: Author's computation, 2015 using Eviews.

The above result also implies that these variables are structurally unstable and may contain unit root. However, before presenting the unit root test, the result of correlation of the variables is presented in table 5.2 below. In the correlation matrix result, the dependent variable (RGDP) showed positive association with banking credit as ratio of GDP (BC/GDP), credit to private sector as ratio of GDP at basic prices (CPS/GDP), total loans and advancement (TLA), total banking savings (TS) and total banking savings as ratio of GDP (TS/GDP), but negatively related with loans-to-deposit ratio (LDR) and interest rate spread (IRS).

TABLE 5.2: Correlation Matrix.

	BC_GDP	CPS_GDP	LDR	IRS	RGDP	TLA	TS	TS_GDP
BC_GDP	1.000000	0.666180	0.158622	-0.338970	0.336768	-0.095758	0.824814	0.508026
CPS_GDP	0.666180	1.000000	0.180008	-0.447357	0.506946	0.440573	0.723931	0.575117
LDR	0.158622	0.180008	1.000000	0.128455	-0.375633	0.182483	0.103883	0.363442
IRS	-0.338970	-0.447357	0.128455	1.000000	-0.281507	-0.351925	-0.501084	0.102469
RGDP	0.336768	0.506946	-0.375633	-0.281507	1.000000	0.034521	0.412662	0.052431
TLA	-0.095758	0.440573	0.182483	-0.351925	0.034521	1.000000	0.374448	0.069821
TS	0.824814	0.723931	0.103883	-0.501084	0.412662	0.374448	1.000000	0.471640
TS_GDP	0.508026	0.575117	0.363442	0.102469	0.052431	0.069821	0.471640	1.000000

Source: Author's computation, 2015 using Eviews

.
One interesting indication of the magnitude of the correlation value is an evidence of no multicollinearity among the selected variables. This is because all the values are not in excess of 0.8 in absolute term, according to a rule of thumb. The rule of thumb is that if the R^2 is less than or around 0.8, then the F-test must indicate that the regression is significant. Hence T-test is likely to be significant; but when they are above 0.8, or are not significant, then we suspect the presence of multicollinearity.

5.2 Unit Root Analysis of the Variables.

In "an attempt to estimate the relationship between financial development and economic growth in Nigeria, the first task is to examine the unit root and long-run linear combination in the stochastic series. This is necessary in order to ensure that the variables are estimated in their stationary forms to avoid spurious result. To do this, both the Augmented Dicky-Fuller (ADF) and Phillips-Perron (PP) tests are used. "The essence of the ADF is to test the null hypothesis of unit root or non-stationary stochastic process. On the other hand, the PP test differs because it provides a more robust test for serial correlation and time dependent heteroskedasticities of the stochastic process" (Gujarati, 2004).

Table 5.3 below presents the results of ADF and PP test statistics for the levels and first differences of the stochastic time series data for the period, 1970 - 2013. The asterisk (*) denotes rejection of the unit root hypothesis at the 5% level, while the asterisk (**) denotes rejection of the unit root hypothesis at the 1% level respectively. The ADF statistics were generated with a test for a random walk against stationary AR (1) with drift and trend with maximum lag of 9. While the PP test uses the automatic bandwidth selection technique of Newey-West. Note that the shaded portion in the unit root table 5.3 below indicates the dependent variable in the methodology.

Table 5.3: Unit Root Analysis.

VARIABLE	ADF t-Stat				Adj. PP t-Stat			
	Level	Level prob.	1ST Diff,	1st Diff. Prob.	Level	Level prob.	1st Diff.	1st Diff. Prob.
RGDP	0.166833	0.9672	-6.029691	0.0000	0.070552	0.9597	-6.035019	0.0000
CPS/GDP	-2.136525	0.2320	-6.538722	0.0000	-2.037493	0.2703	-11.35199	0.0000
IRS	-0.380417	0.9031	-7.945691	0.0000	-1.506866	0.5207	-12.30209	0.0000
BC/GDP	-3.373540	0.0175	-4.962281	0.0002	-3.202357	0.0267	-15.59974	0.0000
TS/GDP	-2.005194	0.2836	-5.913205	0.0000	-2.10618	0.2433	-5.911244	0.0000
LDR	-3.171349	0.0287	-6.262428	0.0000	-3.391513	0.0167	-6.602670	0.0000
TLA	-3.376575	0.0174	-4.628621	0.0008	-3.376575	0.0174	-10.40852	0.0000
TS	3.446677	1.0000	12.06869	1.0000	-2.603944	0.2150	-6.181151	0.0000

Where
RGDP = Real GDP at basic prices (N' million)
TS = total banking savings
TLA = total loans and advancement
CPS/GDP = credit to private sector as ratio of GDP at basic prices
TS/GDP = total banking savings as ratio of GDP
LDR = loans –to – deposit ratio
IRS = interest rate spread, measures differences btw savings and prime lending rate
BC/GDP = banking credit as ratio of GDP

Source; Author's computation, 2015 using Eviews.

In the unit root result, some of the variables which include banking credit as ratio of GDP (BC/GDP), loans-to-deposit ratio (LDR) and total loans and advancement (TLA) are integrated of order zero ($\Delta = 0$). But all the variables are integrated of order one ($\Delta = 1$), they include the dependent variable (RGDP), credit to private sector as ratio of GDP at basic prices (CPS/GDP), total banking savings (TS), total banking savings as ratio of GDP (TS/GDP), and interest rate spread, (IRS). 'The fact that the dependent variable is integrated of the same order with some explanatory variables is a prerequisite for the presence of long-run linear combination among them' (Gujarati, 2004).

5.3: Johansen Cointegration test.

This test seeks to identify "the number of co-integrating relationships that exist in the model. The study adopted

the co-integration method developed by Johansen, popularly called the Johansen co-integration test or cointegration rank test. This test identifies the number of stationary long-run relationships that exist among the set of integrated variables. It offers two tests, the Trace test and the Max-Eigenvalue test. The trace statistic show that the null hypothesis is at most *r* number of co-integrating relationships among the variables. In other words, a rejection of the null hypothesis means that there are more than *r* numbers of co-integrating relationships. The null hypothesis is rejected if the Max-Eigenvalue statistics exceeds the critical value" (Johansen, 1991).

TABLE 5.4: Johansen Co-integration Analysis

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	1% Critical Value
None	0.083811	3.839113	15.41	20.04
At most 1	0.003867	0.162729	3.76	6.65

***(**) denotes rejection of the hypothesis at the 5%(1%) level**
Trace test indicates no co-integration at both 5% and 1% levels
Source: Author's computation, 2015 using Eviews.

Trace test indicates no co-integration at both 5% and 1% levels. This evidence was reached from the result in table 5.4, which shows that up to 1, the trace statistic values are less than 5% and 1% critical values. However, in order to further confirm the result, the maximum eigenvalue statistic result is presented. It "tests the null hypothesis of *r* versus *r*+1 co-integrating relationships. This test rejects the null hypothesis if the max-eigenvalue test statistics exceeds the respective critical value" (Johansen, 1988).

TABLE 5.5: Results of Maximum Eigenvalues

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5% Critical Value	1% Critical Value
None	0.083811	3.676384	14.07	18.63
At most 1	0.003867	0.162729	3.76	6.65

***(**) denotes rejection of the hypothesis at the 5%(1%) level**
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels
Source: Author's computation, 2015 using Eviews

.

Again, the Max-eigenvalue test indicates no cointegration at both 5% and 1% levels. According to Gujarati (2004), "absence of cointegration suggests that there is no long run relationship among the variables". Therefore there is no need for error correction model, thus the study presents the VAR estimation result.

5.4 Granger Causality Analysis.

Given the result of the unit root and cointegration, the causality between economic growth (RGDP) and the financial deepening variables is estimated. Using the SVAR Pairwise Granger test of causality, the result as presented in table 5.6 below showed a short-run unidirectional and bi-directional causality between real GDP (RGDP); CPS/GDP; TS/GDP; BC/GDP; IRS; LDR; TLA; and TS.

TABLE 5.6: Pairwise Granger Causality Tests.

Cause → Effect	F-Statistic	Prob.
RGDP → BC_GDP	4.05783**	0.02551
BC_GDP → RGDP	0.18976	0.82796
RGDP → CPS_GDP	4.65099**	0.01578
CPS_GDP → RGDP	1.60487	0.21459
RGDP → IRS	1.62870	0.20994
IRS → RGDP	0.61051	0.54845
RGDP → LDR	2.26440	0.11810
LDR → RGDP	0.01654	0.98360

RGDP → TLA	0.35878	0.70093
TLA → RGDP	2.93454**	0.06562
RGDP → TS	0.31925	0.72868
TS → RGDP	2.99444**	0.06232
RGDP → TS_GDP	0.04545	0.95562
TS_GDP → RGDP	0.08404	0.91957

Source: Author's computation, 2015.
Note that ** indicates significant at 5%

The result indicated that short-run significant causal relationship exist between some variables, while others showed no significant causal relationships. Specifically, the result showed that real GDP statistically granger causes banking credit as a ratio of GDP (BC/GDP), with F- statistical value of 4.05783. On the other hand, BC/GDP does not statistically significantly cause the real GDP, with value of 0.18976 in accordance with the rule of thumb. '(The rule of thumb is that if the estimated F-value is greater than the critical value of 2.5 in the F-table, then the model is significant, while if the estimated value is smaller than the critical value, then it is not significant)'. Also indicated is statistical significant short-run causal relationship from real GDP to credit to private sector ratio to GDP (CPS/GDP), which shows statistical value of 4.65099. Again, the reverse is not the case on these two causal relationships (with F-statistical value of 1.60487). The findings in this section are in tune with literature.

Also, the result showed that total loan and advances (TLA) statistically significantly granger causes real GDP, with statistical value of 2.93454. On the other hand, real GDP does not granger causes TLA with the value of 0.35878. The result further confirmed that there is a unidirectional relationship moving from total savings (TS) to real GDP with the statistical value of 2.99444 according to the rule of the thumb as stated above.

Furthermore, all other variables showed no short-run significant causal relationships with real GDP. 'This is because none of the statistical value associated with them is less than -2 or greater than 2 at 5% level of significant and therefore shows no causal relationships' (Gujarati, 2004). However, the findings that real GDP has no significant bidirectional short-run causal relationships with variables such as total loans and advancement (TLA), loan to deposit ratio, interest rate spread and total savings in Nigeria, is in contrast to findings in Pakistan. In Pakistan, Aurangzeb (2012) confirms "the bidirectional causal relationship of deposits, advances and profitability with economic growth, and unidirectional causal relationship of investments and interest earnings with economic growth running from investments and interest earnings to economic growth".

6.0 CONCLUSION.

Empirical evidence from this study confirmed that the Granger-Causality tests of some of the Financial Development variables tested showed a unidirectional causal relationship moving from economic growth to some of the variables like BC/GDP and CPS/GDP. Specifically, the result revealed that real GDP significantly granger causes BC/GDP and CPS/GDP, but the reverses were not the case. This is in line with findings in existing literature. In China, Liang and Teng (2006) investigated similar case for the period of 1952–2001, and "found a unidirectional causality running from economic growth to some bank's financial development indicators". Conversely, the findings also proved that total loan and advances (TLA) and total savings (TS) significantly granger causes real GDP on a unidirectional manner. Interestingly, the Granger causality test also revealed that causality moved from economic growth to the bank credit as a ratio of GDP as well as credit to the private sector as a ratio of GDP. On the other hand, causality runs from total loan and advances and total savings as a ratio to GDP to economic growth. Thus, Macroeconomic policy mix of both fiscal and monetary policy is recommended as to increase the total banks' savings, and make loanable funds available to lend to the private sector. This is because financial intermediation is required for the development of the real sector, as investors will be constrain in terms of finance to increase or expand their output from internally generated funds if not encouraged. Again, advancement in the financial sector which includes diversification of financial instruments should be pursued aggressively to sustain economic growth in Nigeria. Finally, Lower costs of borrowing (at a single digit) would induce the desire for credit expansion and thereby encouraging investment activities and economic growth and development in the country.

REFERENCES

Abeng, M.O. (2006). Financial Sector Reform Outcomes in Nigeria: a Quantitative Evaluation. *CBN Bullion*, 30(2), 12-14.

Ademu, W.A. (2006). The Informal Sector and Employment Generation in Nigeria. *Paper presented at the 49th Annual Conference of Nigeria Economic Society, Calabar*, 22-24 August, 2006.

Adeoye, B. W. (2007). Financial Sector Development and Economic Growth: the Nigerian Experiences. *Published in selected papers from the 2007 Nigerian Economic Society Annual Conference 2007, 43-70.*

Akinboyo, O.L. (2007). Micro Finance Banks: Unlocking the Potentials of Micro – Business Activities of the Nigerian Rural Economy: *CBN Bullion*, 33(1), 39-50.

Attamah, N. (2001). *Outline Topics in Financial Institutions*. Enugu: Nigmos Publishers.

Aurangzeb, D. (2012). Contribution of Banking Sector in Economic Growth: A Case of Pakistan. *Economics and Financial Review* 2(b), 45-54.

Balogun, E.D. (2007). Banking Sector Reforms and the Nigerian Economy: Performance, Pitfalls and Future Policy Options. *Minich Personal Re PEC Archive Paper* No. 3804.

CBN (2015), Central Bank of Nigeria 2015 Annual Economic Report, CBN Abuja.

Central Bank of Nigeria (2015).Annual Report and Statement of Account for various years.

Chand, S. (2014). *Commercial Banks*: *7 Important Role of Commercial Banks in a Developing Country in India*. New Dehli: Bosman publishers.

Dickey D.A and Fuller, W.A (1979). Distribution of the Estimators for Auto Regressive Time Series with Unit Root". *JAM Statistic Association*, 74,427-431.

Dickey, D.A and Fuller, W.A (1979). Distribution of Estimates of Auto Regressive Time Series with Unit Roots, *Economics Journal*, 1(1),40-49.

Ekehund, J. and Tollison, R.D. (1986). *Macro Economics*. New York: Little Brown and Company.

Ekpo, A.H. (2014). Nigeria, the unemployed and the waiting Time Bomb*; In Tell Magazine, May 5,4.*

Granger, C and Newbold, P. (1974). Spurious Regressions in Econometrics. *Econometrical* 2, 111 – 120.

Granger, C.W. (1983).Co-integrated variables and Error – Correction Models. *University of California Working paper*, 2, 83 – 113.

Gujarati, D.N. (2004). *Basic Econometrics*. New York: MacGraw – Hill Inc

Hao, C. (2006). Development of Financial Intermediation and Economic Growth: The Chinese Experience. *China Economic Review*, 17 (4), 347-362.

Jackson, D. (1982). *Introduction to Economics: Theory and Data*. Britain, Macmillan Press.

Jhingan, M.L. (2006). *The Economic of Development and Planning*. New Dehli: Virnda Publication Ltd.

Johansen S. (1991). Estimation and Hypothesis Testing of Co-integration Vectors in Graussian Vector Autoregressive Models, *Econometrical*, 1(2), 236-240.

Johansen, S. and Juselius K. (1990). Maximum Likelihood Estimation and Inference of Cointegration with Applications to the Demand for Money. *Oxford Bulletin of Economic and Statistics*, 1(1),2-14.

Keynes, J. (1936). *The General Theory of Employment, Interest and Money*. Cambridge: Macmillan Press.

King, R and Levine, R (1993). Financial and Growth: Schumpeter Might be Right: *Quarterly Journal of Economics*, 1, 717 – 737.

Mckinnon R (1973). *Money and Capital in Economic Development*. Washington DC: Brookings Institute.

NBS, (2022). National Bureau of Statistics (2022) Federal Republic of Nigeria

Ndebbio, J.E.U (2004). Financial Deepening, Economic Growth and Development: Evidence form selected SSA Countries. *African Economic Research Consortium Research Paper*, 142, 20-27.

NDIC (2014). Nigeria Deposit Insurance Corporation Statistical Report, 2014, Federal Republic Of Nigeria Abuja.

Nwoba P. (2009) Nigeria's Financial System Strategy 2020. Conceptual Framework, Issues and Challenges. *CBN Bullion*, 33(4), 3-15.

Ogege, S and Shiro, A.A (2013). Does Depositing Money in bank impact economic growth? Evidence from Nigeria. *African Journal o f Business Management*, 7(3), 196-205.

Onuioduokit, E. (2007). Financial Sector Development and Economic Growth in Nigeria. *Selected Papers from the 2007 NES Annual Conference*, 71-95.

Onwuioduokit, E.A and Adamu, (2005). Financial liberalization in Nigeria: An assessment of Relative Impact. A Paper presented at Nigerian

Economic Society Annual Conference held at Lagos, 23-25 August, 2005, 393-426.

Rousseau, P. and Wachtel W. (2005). Economic Growth And Financial Depth; Is The Relationship Extinct Already. *Discussion paper 2005/10 United Nations University.*

Rousseau, P.L. and Wachtel, P. (2009). *What is Happening to Growth.* This article is an extension of a paper prepared for the UNU/WIDER Conterance on Financial Fector Development for Growth and Poverty Reduction, http://onlinelibrarywiley.com.

Samuelson, P. A. and Nordhaus, W.D.(2005). *Economics.* Singapore: McGraw Hill Education.

Sanusi, L. (2012). Banking Reform and Its Impact To The Nigerian Economy. *Being a lecture delivered at the University of Warwicks Economics Summit, United Kingdom on 17th February 2012.*

.Schumpeter, J. (1936).*The Theory of Economic Development*, Cambridge, Harvard University Press.

Schumpeter, J.A (1934). *The Theory of Economic Development*, Cambridge; Harvard University Press.

Sergeant, (2001). The Role of Commercial Bank in Financing Growth and Economic Development in Trinidad and Tobago and the Taribbean: a Perspective from The Royal Bank. *A Paper Presented at Annual Monetary Studies, Trinidad and Tobago, November 19- 23, 2001.*

Shaw, E. (1973). *Financial Deepening in Economic Development.* London: Oxford University Press.

Shaw, E.S. (1973). *Financial Deepening in Economic Development*. New York: Oxford University press,

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*. 48, 1-48.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

INTRA-CITY PUBLIC TRANSPORT DRIVERS' ATTITUDE: IMPLICATIONS ON SUSTAINABILITY OF TOURISM INDUSTRY IN IBADAN METROPOLIS, OYO STATE, NIGERIA

[1*]Olukemi Deborah Adedokun Fagbolu, [2*]Adekunle Afeez Bashiru & [1*]Olubunmi Modupe Ajayi
[1]Department of Tourism Studies, National Open University of Nigeria, Nigeria
[2]Department of Tourism and Hospitality Management, Kwara State University, Nigeria
[*]ofagbolu@noun.edu.ng; adekunle.bashiru@kwasu.edu.ng; haymaam@gmail.com

ABSTRACT
This paper analyzes intra-city public drivers' attitudes and identifies the implications of the public drivers' attitudes on the sustainability of the tourism industry growth within Ibadan Metropolis. It adopts descriptive research design and quantitative methods. A purposive sampling method was observed while collecting data through Five Point Likert Scale Appreciative Inquiry (FPLSAI) questionnaire on the spot from 180 drivers. Data gathered are presented in tables and analyzed using PSPP frequency and percentage analytical free software. he study having a sample size of 180 public drivers discovers that drivers are adults with informal and formal education backgrounds who have been driving taxi cars and minibuses between morning and night with 1-25 years of experience. The driver majority agreed that making and receiving calls, overloading, disobeying traffic laws and rules, alcohol drinking, and smoking are dangerous to the health, and lives of tourists and avoidable delays on the road. In the same vein, careful driving is significant to safety on the road, the lives of tourists, and patronage at tourism destinations. It was further discovered that adequate information on tourist locations, regular travel schedules, and modes of transport is imperative to the sustainability of the tourism industry growth in the Metropolis. The study recommended that intra-city public drivers should be trained and sensitized on responsible public drivers' attitudes by the appropriate agencies and tourism business owners need to produce and equip the drivers with promotional items such as fliers, posters, and handbills to showcase tourism destinations in the town to tourists

Keywords: *Drivers' attitude, public transport, sustainable tourism, tourism industry, tourists*

1.0 INTRODUCTION
Transport takes a significant position as an important sector having significant implications on governance, social wellbeing, and the economy of national growth and development. Modes of intra-city public transportation include taxis, molue, minibuses, kabukabu, and motorcycles among others operated by private individuals (Aderamo & Olatujoye, 2013; Eniola & Dada, 2018; Neumann, 2014; Olubomehin, 2012; Oluwakoya, 2020). A substantial deviation exists between the type of mass transit commuters patronize and the level of gratification. Transportation and tourism issues have a critical implication on economic performance (Ajudua *et al*., 2022; Fagbolu *et al*., 2022). Public transit agencies are always searching for means of increasing their ridership and avoiding delays (Olorunnimbe, Oni, Ege & Giwa, 2022). Around the globe, service quality relating to public transportation continues to be one of the issues confronting authorities and transportation stakeholders. Meanwhile, several factors influence customers' attraction to destinations (Adesina-Uthman *et al*., 2023; Imaz, *et al*., 2015; Odufuwa *et al*., 2019; Sum *et al*. 2020).

The theory of demand and supply provides the theoretical foundation for this study (Al-Daini, Danilina & Alaraza, 2021). The theory has it that people do not just travel out of necessity but to practice activities in various places. As a result, demand for transport by tourists is derivative in nature towards visiting places of interest, attractions, and tourism destinations for leisure purposes. Although, there are extant literature on determinants of travel behavior, tourists' satisfaction with public transport services, the importance of transportation to tourism development (Aiyegbajeje, 2019; Ali, Nwosu & Okpe, 2019; Dinu, 2018; Kundi, 2013; Mabajoye, 2019; Oluwaseyi, Olaniyi & Joshua, 2019) but there is a dearth of studies on intra-city public transport drivers' attitude and implications on sustainability of the tourism industry. Hence this current research is conducted to achieve the objectives below:

RESEARCH OBJECTIVES
To investigate the effect of possible intra-city public drivers' attitudes on the sustainability of the tourism industry in the Ibadan Metropolis.

Examine the influence of careful driving by intra-city public drivers on the sustainability of the tourism industry in the Ibadan Metropolis.
Investigate the influence of knowledge of adequate information on tourism destinations among intra-city public drivers on the sustainability of the tourism industry in Ibadan Metropolis.

RESEARCH QUESTIONS

How do possible intra-city public drivers' attitudes affect the sustainability of the tourism industry in Ibadan Metropolis?
To what extent does careful driving by intra-city public drivers influence the sustainability of the tourism industry in Ibadan Metropolis?
How does knowledge of adequate information on tourism destinations among intra-city public drivers affect the sustainability of the tourism industry in Ibadan Metropolis?

INTRA-CITY PUBLIC TRANSPORTATION

Intra-city public transportation driving as a psychomotor exercise demands combined good visual functions and mental concentration. The achievement of a public transport policy might depend on the design of its network. Its challenges are often emanating due to disequilibrium in the government policy affecting transportation management and administration. The challenges include transportation policy and system performance. safety in the transport sector, provision of transport infrastructures, finance, vulnerability to terrorist strikes, low revenue generation capacity building, and low service delivery. Increasingly congested facilities, high transportation costs, inadequate transport administration, and lack of harmonious policy implementation tend to create an acute shortage of total revolution for specific policy formulation and implementation affecting the sustainability of other sectors of the economy including the tourism industry (Bashiru & Fagbolu, 2022; Eniola & Dada, 2018; Oluwakoya, 2020).

Eniola and Dada (2018) considered the satisfaction of commuters with the services of public mass transit. The study in a multi-stage sampling method utilized a survey to collect data from 601 commuters and seventy staff. The study discovered that a substantial deviation exists between the type of mass transit commuter patronize and the level of gratification. It concluded that commuters are unsatisfied with the public mass transit in the country. Ali, Nwosu and Okpe (2019) assessed tourists usage and perception of public transport services in Lagos. The authors utilized a self-rating questionnaire with an intercept survey to collect data at the selected tourist sites in the city. Descriptive statistics, principal component analysis, and discriminant function analysis were used to analyze data. The results revealed that tourists were unsatisfied with the public transport services in Lagos. The principal component analysis results discovered traveling security, accessibility, journey comfort, traveling information, and customer services influence tourists' contentment with public transportation services. The authors recommended extensive improvement of public transport systems that will enhance the satisfaction of tourists and aid in addressing tourists and challenges facing local users of public transport systems in getting to their destinations in the city.

Wang, Wang, Shi & Xu (2022) analyzed risky driving behaviors among bus drivers. Utilizing a large sample size of 331 bus drivers, a structured and anonymous instrument was employed to measure enterprise management, external environment, attitudes towards traffic safety, and self-reported risky driving behaviors. Such as speeding, fatigued driving, and running the light. The research used the structural equation model (SEM) to examine the relationship between enterprise management and the external environment about risky self-reported direct or indirect driving behaviors through the influences of attitudes toward traffic safety. It revealed that a direct significant relationship existed between bus drivers' attitudes towards road safety about the five types of risky driving behaviors reported. The findings suggested measures associated with the impact factors to reduce the probability of risky driving behaviors. The measures cover prioritizing signals to reduce road congestion, salary level improvement, bus lanes, safety education implementation, and optimizing shift schedules. In the context of public transport, the findings provide an empirical basis for evidence-based road safety interventions.

A study, Imaz *et al* (2015) in the context of public transit discovered some of the issues that influence customer loyalty through a mixed Stated Preference/Related Preference survey. The factors investigated comprised service attributes, socio-economic features, trip qualities, and psychological attributes of individuals. The study found that service quality attributes play a significant role in transit user loyalty. Initiatives like the availability of the marking park, provision of real-time information, and ride facilities have less effect on the customers' decisions regarding their public transit emotional response

Mabajoye (2019) designed a study to evaluate the effects of multimedia-based road safety education (MbRSE) on

knowledge, attitude towards safe driving behavior (SDB), educational attainment (EA), and driving experience (DE) among inter-state commercial mini-bus drivers in Ibadan metropolis, Nigeria. The article adopted Bandura's Social Cognitive Theory and utilized the pretest-posttest control group quasi-experimental design with a 2x2x3 factorial matrix. The treatment lasted eight weeks in parks and was randomly assigned to 41 and 37 MbRSE and control groups, respectively. The SDB knowledge test, SDB Attitude, and DE rating scales were used for data collection and analyzed using descriptive statistics—analysis of covariance and Scheffe post-hoc test at 0.05 level of significance. The research discovered that the treatment had significant main effects on attitude, knowledge, and SDB. MbRSE enhanced the knowledge of and attitude toward safe driving behavior among inter-state commercial mini-bus drivers in the city. Also, interventions targeted at changing behavior of the commercial drivers especially those with informal education and low driving experiences should be formed on the use of multimedia.

In a study, Aiyegbajeje (2019) examined the factors that influence sustainable intra-modal competition based on diverse Lagos populations and mode choice behavior. The paper randomly sampled 174 commuters through a structured questionnaire from selected areas where all three modes namely traditional taxi (Lagos yellow cabs), Uber, and Bolt operate within the Lagos metropolis. This is to explore reasons behind their preferences and their perception of the service delivery of ride service of Uber and Bolt operators in comparison to the traditional taxi (Lagos Yellow Cabs). The findings revealed that Uber had the highest preference followed by Bolt. Furthermore, through stepwise multiple regression, the results revealed that the use of ride-sharing apps provides easy access to Uber and Bolt while service charges had a significant influence on passengers' intra-mode preference. The article recommended that the government need to step up action at reviving the 'yellow cabs' to boost access to their services within the Lagos metropolis.

Kundi (2013) assessed factors affecting customers' satisfaction with urban commercial transport in the Kogoma Region of Tanzania. The author utilized a questionnaire, interview, and observation to gather data from 126 research participants. The data were analyzed through SPSS software 16.0 versions. The outcome of the study revealed the number of public vehicles available, number of passengers available for each route, number of routes scheduled, maintenance expenses of the vehicles, and running costs in terms of fuel and labor as the factors determining price setting. The factors identified stabilized public transport and are vital to their daily usage as commercial transport in the area. The paper posits that management needs to ensure that the number of public vehicles required is available, the number of routes is properly scheduled, the number of passengers for each route is known, and maintenance expenses of vehicles are minimized. Others include running costs in terms of fuel and labor, handling pregnant women, careful handling of disabled and sick people, and avoiding bad language to customers. Passengers while traveling need to pay their fare, accordingly, to avoid abusing language and developing the habit of smoking and overdrinking.

Dinu (2018) affirms tourism as an emerging sector of tourism strategies and leisure attitudes worldwide. Transport based on its capability of movement of people affects tourism. Imperatively without movement, there will be no tourism and travel industry. Thus, transportation development is connected to tourism development. Tourists need to select a suitable choice of transportation to reach their leisure destinations. According to Kovačić and Milošević (2016), shuttle service in tourism lies in the physical accessibility of a specific destination, on transit within the attraction, and the mode of transport selected. Thus, transport is beyond the act of reaching a destination while movement by a vehicle can also be a form of tourist attraction. Thus, various kinds of partnerships exist between transport sectors, tourism, and tourism development (Palhares, 2003; Virkar & Mallya, 2018).

Spasojevic, Lohmann and Scott (2018) opine that tourism and transport are mutually dependent sectors. Meanwhile, Virkar and Mallya (2018) revealed various dimensions of the transport mode affecting tourist satisfaction such as accessibility, perceived value, service quality, and destination image. The authors examined different dimensions of the transport modes that impact tourists' satisfaction and transport services. The study shows that transport plays a significant role in tourism development. Notably, in the context of a circular and sustainable economy, road transport infrastructure is identified as a feature whose significance is rising.

Several authors have investigated factors affecting customers' satisfaction with urban commercial transport, assessed tourists usage and perception of public transport services and examined the factors that influence sustainable intra-modal competition. The papers utilized questionnaire, interview, observation, self-rating questionnaire with an intercept survey to gather data (Aiyegbajeje, 2019; Kundi, 2013; Nwosu & Okpe,

2019). Based on the literature review, this current research investigates intra-city public drivers' attitudes, careful driving and adequate information on the sustainability of the tourism industry in the Ibadan Metropolis. The research questions above, therefore, provided guides during the study.

2.0 RESEARCH METHODOLOGY

An appreciative inquiry (AI) structured research questionnaire forming four (4) sections on a Five Point Likert Scale of strongly disagree (SD), disagree (D), neutral (N), agree (A), and strongly agree (SA) was developed to collect data for the study. A pilot study is conducted where the survey is administered to twenty pretest respondents. Cronbach's Alpha is adopted to test the reliability of the instrument (Cronbach 1951; GNU PSPP Statistical Analysis Software 2018). It adopts descriptive research design and quantitative methods. The population of the study makes up public transport drivers in all the commercial vehicle parks in Ibadan, Oyo State, Nigeria (see Figures 1 and 2 respectively).

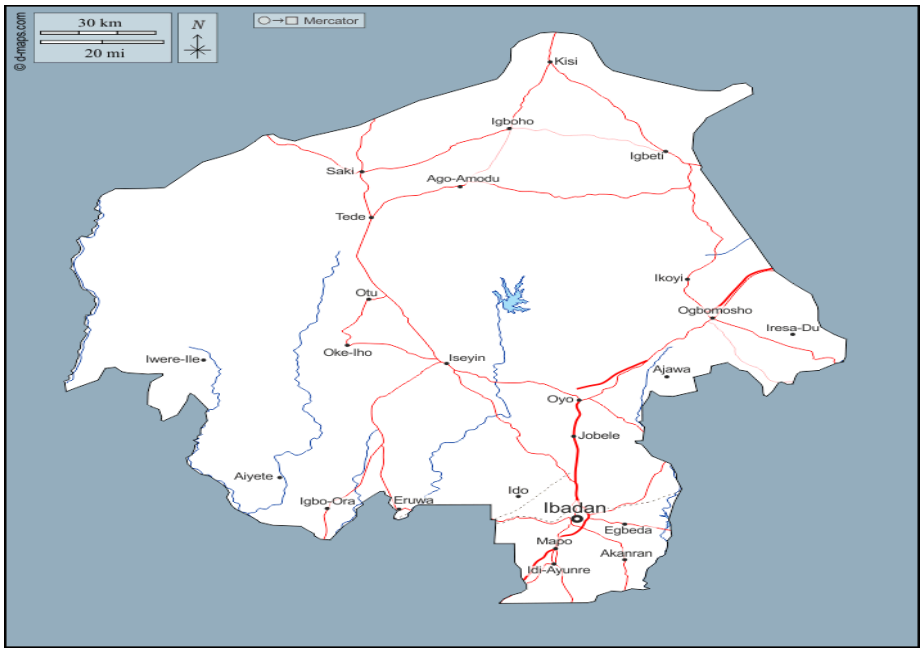


Figure 1: Map of Local Governments in Ibadan, Oyo State, Nigeria.
Source: A map showing Local Government Areas in Oyo State, Southwest, Nigeria.

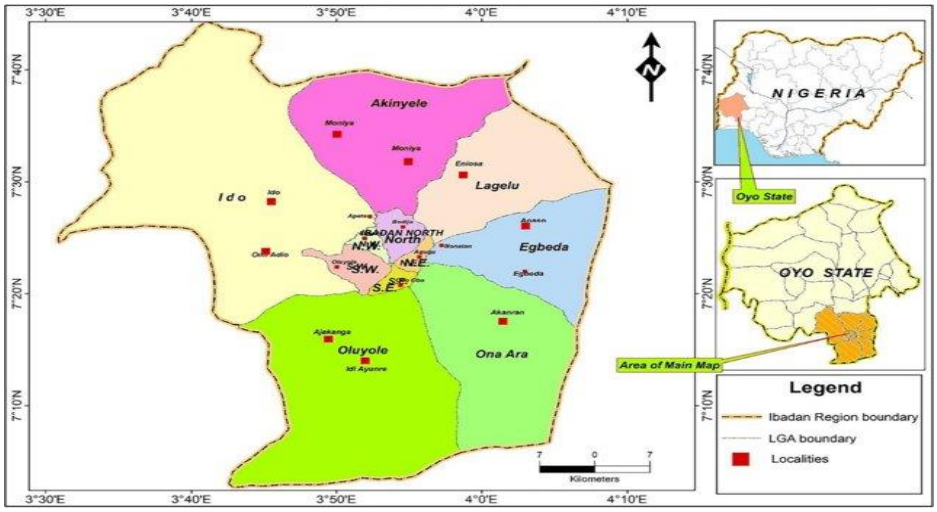


Figure 2: Map of Major Towns in Oyo State, Nigeria.
Source: A Map showing Local Government Areas in Ibadan, Oyo State.

Ibadan, known as the 7th largest city in Africa (World Atlas, 2024), embodies five Local Government Areas, viz, Ibadan North, Ibadan Northeast, Ibadan Northwest, Ibadan Southeast, and Ibadan Southwest. A list of local government areas and major parks in each of the local government areas in Ibadan is compiled during the main study while a lottery method was employed to blindly pick four (4) major parks due to the time limit for the study. The selected parks form the study areas for the study due to the inability to cover the entire population. The sample size of 180 was drawn out of a population of 327 for this research according to the Taro Yamane formula (Yamane 1967):

$n = N/(1+N(e)^2$

where: N = sample size
N = population size
E = margin error

Therefore: $n = 327 / (1 + 327(0.05)^2$
$n = 327/ (1 + 0.8175)$
$n = 327 /1.8175$
$n = 179.91745$
$n = 180$ (approximately)

A purposive sampling probability sampling method is used during the administration of the survey to the drivers in each park to select forty-five (45) respondents from each of the parks accounting for one hundred and eighty (180) sample size. In the process, the researchers administered the survey to the respondents, interpreted the questionnaire to the illiterate drivers, and aided them in filling in their choices of responses. A tabular method is adopted to present the data while PSPP statistical analysis to supply frequencies and simple percentages (GNU PSPP Statistical Analysis Software 2018) is employed to analyze the data.

3.0 RESULTS AND DISCUSSIONS

The findings based on the data collected in the field are presented in tables according to the profiles of the participants, the implications of intra-city public drivers' attitudes, careful driving, and adequate information on the sustainability of the tourism industry (see Tables 1, 2, 3 and 4 respectively). This quantitative study used descriptive analysis comprising frequencies and percentages and is discussed accordingly in this section. Table 1 highlights information about the profiles of the research participants. The findings in Table 1 disclosed that public drivers cut the age from 18 to 69. Age 18-30 accounting for thirty-four which is 19%. The majority is found among aged 31-43 amounting to sixty represented 33%. Age 44-56 totaled forty-six representing 26%. Those between 57-69 years of age totaled forty and covered 22%. These outcomes displayed that the intra-city public drivers are between the ages of 18 and 69. However, it showed that the majority lie between age 31-43 amounting to one-third of the drivers. This implies that more of this category compared to others are more likely to boost the number of vehicles available to transport tourists to their destination. This aligns with Kundi (2013); Eniola and Dada (2018) who posit that transport managers need to ensure that a reasonable number of public transport needs are made available to enhance passengers' satisfaction with services of public transport.

Table 1: The Profiles of the Research Participants

Label	Items	Frequency	Percentage (%)
Age	18 – 30	34	19
	31 – 43	60	33
	44 – 56	46	26
	57 – 69	40	22
	70 and above	-	-
Total		**180**	**100**
Mode of Public Transportation	Motorcycle	34	19
	Tricycle	48	27
	Taxi cars	24	13
	Molue	--	-
	Minibuses	74	41
Total		**180**	**100**
Period of driving	Morning	48	27
	Afternoon	31	17
	Evening	67	37
	Night	34	19
	After Midnight	-	-
Total		**180**	**100**
Driving Experience (Years)	1 – 6	58	32
	7 - 12	49	27
	13 - 18	32	18
	19 – 24	22	12
	25 and above	19	11
Total		**180**	**100**
Education Attainment	Primary School	**72**	**40**
	Secondary School	**58**	**32**
	NCE/Diploma/OND	**28**	**16**
	First Degree	**22**	12
	Postgraduate	-	-
Total		**180**	**100**

Source: Field Survey Results (2024).

In terms of the mode of public transportation, motorcycle drivers are 34 accounting for 19%, Tricycle drivers amounted to 48 representing 27%, Taxi car operators equal 24 covering 13%, Molue drivers are zero while Mini-buses drivers are 74 representing 41%. The findings are in unison with Aderamo and Olatujoye (2013); Aiyegbajeje (2019); Kovačić and Milošević (2016); Olubomehin (2012); Oluwakoya (2020). This depicts that various modes of intra-city public transportation are available in the city except molue.

During the period of diving, 48 public drivers representing 27% indicated that they operate in the morning, and 31 drivers amounting to 17% drive in the afternoon. In the evening, 67 which was 37% are on duty while 34 representing 19% disclosed that they drive at night and zero after midnight. This shows that drivers run every hour with the majority in the morning and evening. Thus, affirming the findings of Wang *et al* (2022); Kundi (2013) that it is a matter of necessity to ensure adequate and proper optimization of several routes and shift schedules.

In terms of driving experience, 58 representing 32% indicated that they have between 1 and 6 years of driving experience. 49 of them which covers 27% have 7 – 12 years' experience. 32 drivers representing 18% have been driving between 13 and 18 years. 22 which amounts to 12% stated that they have been on steering for 19 - 24 years. 19 representing 11% expressed that they have been driving for over 25 and above. The findings suggest that most of the drivers have low experience.

On education attainment, those drivers who were Primary School level of education were 72 amounting to 404%. Secondary School levers were 58 covering 32%. 28(16%) of the drivers were NCE/Diploma/OND holders. 22 drivers representing 12% had first-degree certificates while none owned post-graduate qualifications. The results disclosed that many of the drivers are informally educated and primary school levers. These align with the findings of Mabajoye

(2019) which suggests that interventions targeted at changing the attitude of the drivers especially those with informal education and low driving experiences should be formed on the usage of multimedia towards enhancing the knowledge and attitude of the drivers towards safe driving behavior in the city.

Table 2: Implications of intra-city public drivers' attitudes on the sustainability of the tourism industry

Items	Frequency	Percentages	Ratings
Making and receiving calls while driving is dangerous to the lives of tourists on the road	-	-	Strongly Disagree
	-	-	Disagree
	16	9	Neutral
	30	17	Agree
	134	74	Strongly Agree
Total	**180**	**100**	
Overloading may cause loss of lives of tourists	-	-	Strongly Disagree
	-	-	Disagree
	4	2	Neutral
	29	16	Agree
	147	82	Strongly Agree
Total	**180**	**100**	
Disobeying traffic laws and rules is likely to cause delays on the road	-	-	Strongly Disagree
	-	-	Disagree
	-	-	Neutral
	28	16	Agree
	152	84	Strongly Agree
Total	**180**	**100**	
Alcohol drinking before may cause reckless driving	-	-	Strongly Disagree
	-	-	Disagree
	-	-	Neutral
	47	26	Agree
	133	**74**	Strongly Agree
Total	**180**	**100**	
Smoking while driving is dangerous to passengers' health	-	-	Strongly Disagree
	-	-	Disagree
	24	13	Neutral
	57	32	Agree
	99	55	Strongly Agree
Total	**180**	**100**	

Source: Field Survey Results (2024).

The results presented in Table 2 showed that 16 representing 17% were neutral. Meanwhile, 30 and 134 covering 17% and 74% agreed and strongly agreed that making and receiving calls by public drivers while driving is dangerous to the lives of tourists on the road. On the attitude of overloading, 4 of which 2% were neutral, 29 representing 16% signified agree, and while majority totaling 147 covering 82% strongly agreed that overloading a vehicle may cause the loss of lives of tourists. Furthermore, zero strongly disagree, disagree, and neutral respectively representing 0% but 28 drivers which are 16% agree while 152 representing 84% strongly agreed that disobeying traffic laws and rules is likely to cause delays on the road. 133 and 47 standing for 74% and 26% strongly agreed and agreed that alcohol drinking before driving may cause reckless driving. 24, 57, and 99 representing 13%, 32%, and 55% were neutral, agree, and strongly agree that smoking while driving is dangerous to passengers' health.

The finding on the impact of public drivers' attitudes toward sustainability of the tourism industry supports Olorunnimbe *et al* (2022); Wang *et al* (2022); Kundi (2013) and Mabajoye (2019). This pinpoint suggests that safety education implementation on attitudes toward traffic safety is significant in reducing risky driving behaviors. According to Kundi (2013), management requires observation of public vehicles, and the habit of smoking and drinking before or while driving should be avoided. Mobajoye (2019) further conforms with the

findings of this study that knowledge of and attitude toward safe driving behavior among minibus drivers.

Table 3: The impact of careful driving among intra-city drivers on the sustainability of the tourism industry

Items	Frequency	Percentages	Ratings
Careful driving by public drivers tends to ensure safe arrivals of tourists at the tourist destination	-	-	Strongly Disagree
	-	-	Disagree
	-	-	Neutral
	28	16	Agree
	152	84	Strongly Agree
Total	**180**	**100**	
Maintaining careful driving can contribute to the safety of tourists on the road	-	-	Strongly Disagree
	-	-	Disagree
	25	14	Neutral
	12	7	Agree
	143	79	Strongly Agree
Total	**180**	**100**	
Maintaining careful driving can improve the number of tourist arrivals at the destination	-	-	Strongly Disagree
	-	-	Disagree
	17	9	Neutral
	18	10	Agree
	145	81	Strongly Agree
Total	**180**	**100**	
Careful driving by public drivers is likely to ensure tourists return patronage	-	-	Strongly Disagree
	-	-	Disagree
	10	6	Neutral
	42	23	Agree
	128	71	Strongly Disagree
Total	**180**	**100**	
Public vehicle drivers ought to be careful while driving to boost tourist perception at the destination	-	-	Strongly Disagree
	-	-	Disagree
	16	9	Neutral
	12	7	Agree
	152	84	Strongly Agree
Total	**180**	**100**	

Source: Field Survey Results (2024)

Table 3 shows the descriptive analysis of the impact of careful driving on the sustainability of the hospitality industry. The findings portray zero amounting to 0% strongly disagree, disagree, and neutral that careful driving by public drivers tends to ensure safe arrivals of the tourists at the tourism destination. Meanwhile, 28 and 152 standing for 16% and 84% respectively showed that careful driving by public drivers tends to ensure safe arrivals of tourists at the tourist destination. 12 and 143 covering 7% and 79% agree and strongly agree respectively that maintaining careful driving can contribute to the safety of tourists on the road while 12 amounting to 7% were neutral on the issue. 17, 18, and 145 stood for 9%, 10%, and 81% were neutral, agreed, and strongly agreed that maintaining careful driving can ensure the safety of tourists on their way to tourist destinations.

On Careful driving by public drivers is likely to ensure tourists return patronage, 10 covering 6% were neutral that careful driving by public drivers is likely to ensure tourists return patronage. However, 42 and 128, which are 23% and 71% agree and strongly agree respectively that careful driving by public drivers is likely to ensure tourists return patronage. 16(9%) were neutral, 12(7%) agreed and 143(79%) strongly agreed that public vehicle drivers ought to be careful while driving to boost tourist perception at the destination. The findings on safe arrivals of tourists at the

tourist destination correspond with Ali, Nwosu and Okpe (2019); Kundi (2013); Mabajoye (2019); Oluwakoya (2020) that careful handling of passengers while traveling is capable of impacting customers' satisfaction in urban commercial transportation. The submission is that safety in the intra-city public transportation sector is paramount to tourists' confidence in patronizing tourism destinations. Similarly, the intra-city transport services in various modes affect tourists' satisfaction in terms of accessibility, service quality, destination image, and perceived value (Virkar & Mallya, 2018).

Table 4: The impact of adequate information by intra-city public drivers on the sustainability of the tourism industry

Items	Frequency	Percentages	Ratings
It is necessary to have adequate and handy information on the locations of tourist attractions	-	-	Strongly Disagree
	-	-	Disagree
	27	15	Neutral
	15	8	Agree
	138	77	Strongly Agree
Total	**180**	**100**	
Information on travel schedules may boost the daily income of public drivers	-	-	Strongly Disagree
	-	-	Disagree
	16	9	Neutral
	48	27	Agree
	116	64	Strongly Agree
Total	**180**	**100**	
Information on modes of public transport can help boost the number of tourists to tourism destinations.	-	-	Strongly Disagree
	-	-	Disagree
	10	6	Neutral
	22	12	Agree
	148	82	Strongly Disagree
Total	**180**	**100**	
Information on a regular schedule is significant to tourists' arrival at tourist destinations	-	-	Strongly Disagree
	-	-	Disagree
	-	-	Neutral
	48	27	Agree
	132	73	Strongly Agree
Total	**180**	**100**	
Information on transport fares helps tourists decide to visit quite several tourist destinations	-	-	Strongly Disagree
	-	-	Disagree
	28	16	Neutral
	47	26	Agree
	105	58	Strongly Disagree
Total	**180**	**100**	

Source: Field Survey Results (2024).

The results in Table 4 show that 27(15%) were neutral, 19(8%) agreed while the majority 138(77%) strongly agreed that it is necessary to have adequate and handy information on locations of tourism attractions. The findings congruent with Wang *et al* (2022); Imaz *et al*. 2015; Kundi (2013); Mabajoye (2019) that the availability of adequate information on the routes they ply is essential to public vehicle drivers. However, the findings contradict Imaz *et al* (2015) expression that initiatives like the provision of real-time information and ride facilities have less effect on the customers' decisions on their public transit emotional response. The outcome of the findings further revealed that 16(9%), 48(27%), and 116(64%) were neutral, agreed, and strongly agreed respectively that information on travel schedules may boost the daily income of public drivers. Referring to Kundi (2013), the results pinpoint that passengers while traveling need to pay their fares accordingly. The fare of

course forms the source of income for public drivers to take care of their vehicles and other needs. 148, 12, and 10 representing 82%, 12%, and 6% strongly agreed, agreed, and neutral respectively that information on several public transports can help boost the number of tourists to tourist destinations. According to Kovačić and Milošević (2016), public transport service in tourism lies in the physical accessibility of a specific destination, passengers in transit within the attraction, and the mode of transport selected. The findings showed that 48 representing 27% agreed while 132 covering 73% strongly agreed that information on a regular schedule is significant to tourists' arrival at tourist destinations. As Neumann (2014) disclosed, the achievement of a public transport management policy is dependent on the road network design. The current result pinpoints that information on a regular schedule is paramount to arrivals at the destinations. The findings revealed that 28(16%) were neutral. Meanwhile, 47 and 105 standing for 26% and 58% agreed and strongly agreed, respectively. This opines that information on transport fares helps tourists make decisions to visit quite several tourist destinations (Mabajoye 2019).

4.0 CONCLUSION

This study explores various intra-city public drivers' attitudes and implications on the sustainability of the tourism industry in Ibadan Metropolis, Oyo state. Intra-city public transport is significantly rising in the city. Given the findings above, this study concludes that public transport drivers' attitudes are significant to the sustainability of the tourism industry. The mode of transportation, driving schedule, driving experiences, and education attainment of the drivers affect their attitudes toward passengers. Furthermore, avoiding making and receiving calls, overloading, disobeying traffic rules, alcohol drinking, and smoking while driving are positive attitudes. They are capable of curbing reckless driving, reducing delays on the road, and ensuring the safety of the lives of tourists on the road. In addition, careful driving by public drivers tends to ensure safety on the road, improve safety and the number of tourist arrivals, tourists return patronage, and boost tourist perception at the destination. It is equally imperative to have adequate and handy information on locations, travel schedules, modes of public transport, and transport fares. The ability to such information can enhance knowledge of tourist attraction locations, and boost tourist visits and arrivals at the tourist attractions. The practicability of the issues raised above is significant to ensuring the sustainability of the tourism industry in the city. The theory of demand and supply is a significant technique to improve on Ibadan city road network for adept performance and comfort for the intra-city public drivers and tourists to promote sustainability of tourism destinations. Hence, this study further contributes to the extant research and body of knowledge on transportation and sustainable tourism. Tourism is expanding greatly. Meanwhile, sustainability of the tourism industry is paramount considering intra-city public transportation improvements. As such, embodiment of public drivers' attitudes, careful driving, and adequate information can aid sustainable tourism industry.

RECOMMENDATIONS

Public drivers should be trained and sensitized to responsible public drivers' attitudes by the appropriate agencies.

It is necessary to encourage illiterate intra-city public drivers to enroll in adult education classes to enhance their reading and writing skills, comprehension, and dissemination of information to their passengers.

There should be a regular campaign on the outcomes of careful driving and the implications for arrival at the tourism destinations.

The necessary tourism agencies need to supply and make adequate and necessary information available to intra-city public drivers to guide tourists upon arrival at different motor parks and at the appropriate quarters.

It is also imperative for tourism operators to sensitize the drivers on tourism attractions and locations in the metropolis.

Tourism business owners need to produce and equip the drivers with promotional items such as fliers, posters and handbills to showcase tourism destinations in the town to tourists.

Similar investigation is required by future researchers in other towns of Nigeria and beyond.

REFERENCES

Aderamo, A. J., & Olatujoye, S. (2013). Trends in Motorcycle Accidents in Lokoja, Nigeria. Eur Int J Sci Technol, 2(6), 251-261.

Adesina-Uthman, G. A., Majebi, E. C., Fagbolu, A. O., & Obaka, A. I. (2023). Analysis of Stakeholders Perceptions of the Impact of Crisis on Tourism in Ogun state, Nigeria. International Journal of Tourism Business Research, 2(2), 37-52.

Aiyegbajeje, F. O. (2019). Determinants of Travel Behavior in the Taxi Transport System in the Lagos Metropolis of Nigeria. Prace Komisji Geografii Komunikacji PTG, 22(1), 13-21.

Ajudua, E. I., Majebi, E. C., Odishika, V. A., Bakare-Aremu, T. A., Nwokoro, A., & Fagbolu, O. D. (2022). Nexus between Tourism Sector Output and Macroeconomic Indicators in Nigeria. JIET (Jurnal Ilmu Ekonomi Terapan, 7(2), 197-209. https://doi.org/10.20473/jiet.v7i2.38313

Al-Daini, R., Danilina, N., & Alaraza, H. A. (2021). Developing a Theoretical Model to Improve the Road Network the a Historical City in Iraq. In E3S Web of Conferences (Vol. 263, p. 05007). EDP Sciences.

Ali, N. A., Nwosu, I. G., & Okpe, K. C. (2019). Tourists' Satisfaction with Public Transport Services in Lagos, Nigeria. AUC GEOGRAPHICA, 54(1), 67-80.

Bashiru, A. A., & Fagbolu, O. D. A. (2022). Sustainable Development Goals and Tourism Development in Nigeria: A Study of Old Oyo National Park Tourism Activities. Journal of Social Sciences, 6(2), 164- 177.

Cronbach, L. J. (1951). Coefficient Alpha and the Internal Structure of Tests. Psychometrika, 16(3), 297-334.

Dinu, A. M. (2018). The Importance of Transportation to Tourism Development. Academic Journal of Economic Studies, 4(4), 183-187.

Eniola, A. A., & Dada, D. (2018). Public Mass Transit (PMT) Services and Commuters' Satisfaction. Triple A Research Journal of Social Science and Humanity, 2(2), 048- 059.

Fagbolu, O. D. A., Orimaye, J. O., Ayoola, A. C., Ajudua, E. I., & Omotoba, N. I. (2022). Tourism and Hospitality Industry: Implications on National Development in Nigeria. Journal of Social Sciences, 6(2), 85-99.

GNU PSPP Statistical Analysis Software (2018). Open-Source GNU PSPP Version1.0.1.g812274.2.1. Retrieved from https://download.freedownloadmanager.org/Windows-PC/PSPP/FREE-1.0.1.html15/11/7/2018

Imaz, A., Habib, N. K. M., Shalaby, A., & Idris, A. O. (2015). Investigating the Factors Affecting Transit User Loyalty. Public Transport, 7, 39-60.

Kovačić, M., & Milošević, T. (2016). Interdependence of Transport and Tourism. Pomorski zbornik, 52(1), 99-111.

Kundi, A. M. (2013). Factors Influencing Customer's Satisfaction in Urban Public Transport in Tanzania, A Case Study of Public Transport in Kigoma-Ujiji Urban (Doctoral dissertation, The Open University of Tanzania).

Mabajoye, E. D. (2019). Multimedia-Based Road Safety Education and Driving Behavior Among Interstate Commercial Mini-Bus Drivers in Ibadan metropolis, Nigeria (Doctoral dissertation).

Neumann, A. (2014). A Paratransit-Inspired Evolutionary Process for Public Transit Network Design.

Odufuwa, B. O., Salisu, U. O., Fasina, S. O., Ogunseye, N. O., & Omoniyi, S. S. (2019). Driving Behavior of Taxi Drivers Towards Sustainable Public Road Transport in Ogun State, Nigeria. Ghana Journal of Geography, 11(2), 199-226.

Olorunnimbe, R. O., Oni, S. I., Ege, E., & Giwa, M. (2022). Analysis of Effects of Prolonged Travel Delay on Public Bus Operators' Profit Margin in Metropolitan Lagos, Nigeria. Journal of Sustainable Development of Transport and Logistics, 7(1), 112-126.

Olubomehin, O. O. (2012). The Development and Impact of Motorcycles as Means of Commercial Transportation in Nigeria. Research on Humanities and Social Sciences, 2(6), 231-239.

Oluwaseyi, O. S., Olaniyi, A. A., & Joshua, A. O. (2019). An Assessment of Passengers' Satisfaction of Commercial Transport in the Federal University of Technology, Akure, Ondo State, Nigeria. License This work is licensed under a Creative Commons Attribution 4.0 International License., 55(287), 591-603.

Palhares, G. L. (2003). The Role of Transport in Tourism Development: Nodal Functions and Management Practices. International Journal of Tourism Research, 5(5), 403-407.

Safitri, D. M., Surjandari, I., & Sumabrata, R. J. (2020). Assessing Factors Affecting Safety Violations of Bus Rapid Transit Drivers in the Greater Jakarta Area. Safety Science, 125, 104634.

Spasojevic, B., Lohmann, G., & Scott, N. (2018). Air Transport and Tourism: A Systematic Literature Review (2000–2014). Current Issues in Tourism, 21(9), 975-997.

Sum, S., Jomnonkwao, S., Champahom, T., Beeharry, R., & Ratanavaraha, V. (2020). Measuring the City Bus Service Quality Based on Users' Perceptions: City Bus Service in Phnom Penh, Cambodia. Engineering and Applied Science Research, 47(1), 47-55.

Virkar, A. R., & Mallya, P. D. (2018). A Review of Dimensions of Tourism Transport Affecting Tourist Satisfaction. Indian Journal of Commerce and Management Studies, 9(1), 72-80.

Wang, L., Wang, Y., Shi, L., & Xu, H. (2022). Analysis of Risky Driving Behaviors among Bus Drivers in China: The role of Enterprise Management, External Environment and Attitudes Towards Traffic Safety. Accident Analysis & Prevention, 168, 106589.

Wilson, G. W. (1973). Towards a Theory of Transport and Development. In Transport and Development (pp. 208-230). London: Macmillan Education UK.

World Atlas (2024). https://www.statista.com/statistics/1218259/largest-cities-in-africa

Yamane, T. (1967). Statistics, An Introductory Analysis (2nd ed.): Harper and Row.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

LATENT CONTRIBUTIONS OF SOME AQUATIC PLANTS IN OWENA RIVER TO ATTAINING SUSTAINABLE DEVELOPMENT IN NIGERIA

Rafiu Olugbenga Sanni[1], Ayomiposi Olayinka Akinkuolie[1] and Ganiyat A. Adesina-Uthman[2]
[1]Department of Biology, Adeyemi Federal University of Education, Ondo. Nigeria
[3]Department of Economics, National Open University of Nigeria, Nigeria
*sanniro@aceondo.edu.ng; akinkuolieao@aceondo.edu.ng;
gadesinauthman@gmail.com

ABSTRACT
Aquatic plants are important ecological resources often overlooked due to their nuisance values in many ecosystems. Nigerian aquaphytes include macrophytes and microphytes that not only maintain the ecological sustainability in the Nigerian ecosystems but also hold economic prospects. Using the Owena River in Ondo State as a case study, this study examined the potential contributions of Nigerian aquatic plants resources to the attainment of the Sustainable Development Goals (SDG) 2, 3, 6, 14 and 15. A review of available annual reports on the SDGs was carried out to determine the current status of Nigeria in the chosen goals. The River is rich in aquatic macrophytes and microphytes communities that can be sustainably exploited for their economic values in food production, water management, aquatic life sustenance, and promotion of personal health of the local community. Some species of the aquatic plants local to the study area, namely Ipomoea aquatica, Azolla pinnata, Ludwigia africana and Sacciolepis africana, were identified as having potentials to improve Nigeria's status if explored.

KEYWORD: *Aquaphytes, Aquatic plants, Macrophytes, Owena River, Sustainable Development*

1.0 INTRODUCTION

Aquatic plants are a community of plants that live permanently and complete their entire life cycle in the water or water saturated environment – both marine and freshwater habitats. The community includes several species of macrophytes and microphytes. The former comprise the many species of vascular plants that are visible to the naked eye found growing within the littoral zones of several water bodies and could grow towards the shores of the aquatic environment while that latter are those plant species which are only visible with the aid of magnifying instruments like hand-held lenses and microscopes. The macrophytes are classified variously as submerged, emergent, free-floating and floating-leaved (UF/IFAS, 2007). The microphytes include phytoplankton and other algal species some of which are also large in size. In whatever form these plants exist, they are known to be of tremendous impacts on the water bodies they colonise. The biological productivity of any aquatic environment is determined by the composition of the aquatic plants community as they form the foundations of the food web of the ecosystem.

The many impacts of aquatic plants have been variously studied and these impacts are not only felt in the aquatic ecosystems but also in the larger society in diverse ways. The aquatic plants (both micro and macro) have been reported by several researchers to play vital roles in the agriculture, livestockfeed and food industries (Van Hove et al., 1996; Jafari, 2010; Chander, 2011; Tamizhkumaran et al., 2012; Muller-Feuga, 2013; Mwale & Gwaze, 2013; Garwa & Veerwal, 2024; Mustafa, et al., 2024). They have been suggested for and used in the bioremediation of polluted waters and also used to stabilize such waters (Khankhane & Varshney, 2009; Bhateria & Jain, 2016; Muhammad et al., 2024). Aquatic plants are good bioindicators and bioaccumulators (Sood, et al., 2012), hence their use in phytoremediation of impacted soils (Zhao, et al., 2024). They have been reportedly used in the textile industry, paper and for camouflaging fish traps (Ecoport, 2011). One key contribution of aquatic plants to the water ecosystem is the production of oxygen. This gas is critical to all living organisms and aquatic plants contribute greatly to its abundance in their habitats via photosynthesis. Xibu (2022) identified the following areas where aquatic plants have impacted the ecosystem – food source for various aquatic animals including the smallest zooplankton communities; shelter for aquatic large and small animals; water quality maintenance to prevent algal bloom which is a phenomenon that can potentially harm aquatic lives and water quality; prevention of erosion especially by the rooted emergent species of aquatic macrophytes which help stabilize the soil and sediments at the bottom of the aquatic ecosystem; and aesthetic features which may attract ecotourism. Some of them are directly involved in provision of biomass and building materials (Egertson et al., 2004, Bornette and Puijalon, 2011).Aquatic plants have also reported as viable biofuel sources (Nahar &

Samwar, 2024). Their roles in Ecosystem Services have also been reported by Pereira, et al. (2024). Ita (1994) determined the aquatic productivity of some Nigerian aquatic plants as presented below:

Table 1: A summary of aquatic plant productivity in Nigeria.

Species	Productivity or standing crop	Crude protein content %	Remark
Ceratophyllum dermersum	ND	21.7	Acceptable to livestock
Pistia stratiotes	2068 kg/ha	12.0	Suitable for pollution control
Echinochloa stagnina	161,000 t/ha (L. Kainji, whole lake)	8.8	Acceptable to livestock
Eichhornia crassipes	ND	1.1	Acceptable to livestock
Ludwigia decurrens	ND	19.1	Acceptable to livestock
Sorghum arundinaceum	446 g/m^2	7.5	Acceptable to livestock

ND – Not determined
Source: Ita (1994)

In contrast to the benefits identified above, aquatic plants can also create hazard for both aquatic and terrestrial lives. A critical instance of this is the algal bloom phenomenon. This refers to a situation whereby eutrophication leads to excessive growth of certain species of algae thereby changing the dynamics of the water-body. This can result in Harmful Algal Bloom (HAB) when such algal species produce toxins into the surrounding water and that occurrence inherently harms other aquatic organisms. Economically,every year, HABs cost the restaurant, tourism, and fisheries businesses approximately $82 million in lost revenue. HABs stop people from visiting beaches and shellfish beds, they also lower the amount of fish caught in both commercial and recreational fisheries, and diminish incoming tourism (NOAA, 2023).Asides from producing toxins, algal blooms deplete the dissolved oxygen content of the affected aquatic habitat thus depriving other aquatic organisms the benefits of the all important element (Hasan et al., 2023). Oxygen is required for energy production in living organisms.

A common roadmap for peace and prosperity for people and the planet, both now and in the future, is provided by the 2030 Agenda for Sustainable Development, which was accepted by all United Nations Member States in 2015. The 17 Sustainable Development Goals (SDGs), which represent an urgent call to action for all nations—developed and developing—in a global partnership, are at the center of it. They understand that addressing poverty and other forms of deprivation, combating climate change, protecting our seas and forests, and promoting economic growth all need to coexist alongside policies that enhance health and education, lessen inequality, and promote economic growth. The whole journey could be traced back to 1992 Rio de Janeiro Earth Summit during which an all-encompassing strategy to create a worldwide alliance for sustainable development in order to enhance human well-being and safeguard the biodiversity was adopted. This was tagged Agenda 21 and several international meetings and conferences have been held to improve and fine-tune the agendas. Of particular relevance to this paper are five of the seventeen agendas namely – 2 (Zero Hunger); 3 (Good Health and Wellbeing); 6 (Cleaner Water and Sanitation); 14 (Life Below Water); and 15 (Life on land).

The General Assembly Economic and Social Council of the United Nations compiled a report on the progress towards the Sustainable Development Goals (SDGs) in May, 2024. The report presented a global overview of progress made since 2015 towards the SDGs. It compiled data inputs from fifty plus international and regional bodies based on the 2017 generally agreed global indicator framework. In the report, it was noted with concerns, that there was yet to be seen any signs of a sustained and determined global comebacks towards achieving many of the goals toward the 2030 set year for such accomplishment. According to Guterres (2024), only 17% of the SDG targets are on track with only about half showing moderate or minimal progress and just a little over one third (1/3) having their progress stalled or even regressed.

In the part on climate and diversity, the report acknowledged some global reductions in greenhouse gas emissions, especially in developed countries; it noted that the emissions reached record high levels in 2022 while real-time data indicated continued increase in 2023. The reported increase of carbondioxide (CO_2) to 150% above the pre-industrial levels present veritable cause for concern. It also reiterated that one of the consequences of the global surge in CO_2levels is ocean acidification. These facts above highlight the need to appreciate the critical contributions that aquatic plants, along with other terrestrial plants, could make in achieving the particular goal on climate and diversity as they are the only living organisms capable of capturing

CO_2 and converting it into organic forms usable by other living organisms. It was also stated in the report that species extinction risk exacerbated as evidenced by a 12% decline in the Red List Index since 1993 (UN, 2024). As highlighted by the UN Secretary- General in his foreword to the report, climate crisis continues to escalate and biodiversity loss is also accelerating (Guterres, 2024).

2.0 MATERIALS AND METHOD

This article reviewed available data on the status of the SDG targets across the globe and with particular focus on Nigeria's status. It also reviewed the report on Owena river aquatic plant resources in Sanni (2021). Four of the dominant aquatic macrophytes were identified and their potential economic benefits were examined.

Study Area

The study area is the Owena river dam, Nigeria. The Owena dam sampling site has an average elevation of 247.50m and located on latitude 7.20^0N and longitude 5.02^0E (these were determined using a GARMIN® eTrex hand-held GPS receiver and was also used to determine the grid references of each sampling station during collection).According to Oyakhilome et al., (2012),the Owena River supplies water to another dam up river at another location before the current study site, which covers a surface area of $7.8km^2$. The water from the dam is used to supply a 60,000 m^3/day water treatment facility erected alongside it, and artisanal local fishermen registered with the Benin-Owena River Basin Development Authority(the dam's managers), engage in fishing.

Identification of aquatic plants

The macrophytes at the Owena river sample sites were collected by physically picking free-floating and submersed species. The emergent and floating-leaved species were uprooted manually. All samples were transported in waterproof polyethylene bags to keep the plant specimens fresh and retain as much moisture as possible. The identification was done at the University of Ibadan herbarium (UHI). The herbarium specimens were prepared for storage in the same herbarium. Each identified specimen was assigned a voucher number as follow: *Ipomoea aquatica* (UIH - 22452), *Azolla pinnata* (UIH - 22449), *Ludwigia africana* (UIH - 22450) and *Sacciolepis africana* (UIH - 22451).

3.0 RESULTS AND DISCUSSION

Global status of the SDG report

The SDG Report (2024) acknowledged ongoing challenges of availability and timeliness of data to monitor all the seventeen goals. These affect the SDG progress assessment. It, however, appreciated the commendable progress made in improving internationally comparable data which are essential for the monitoring of the goals.

Oweibia, et al. (2024) noted that "In its commitment to the SDGs, Nigeria has demonstrated strategic foresight by developing the National Economic Recoveryand Growth Plan (ERGP). This plan resonates with the SDGs' ethos, outlining key strategies for achieving sustainable andinclusive growth."They concluded that Nigeria despite making notable progress in some specific areas aligned with the 'ambitious targets' of the SDGs, "persisting and significantobstacles continue to impede the country's progress towards numerous goals centered on improving socioeconomic conditionsand environmental sustainability."

The statuses of the five goals of focus in this article are presented below;

Goal No. 2 – Zero Hunger:The report highlighted that 2.4 billion people suffered 'moderate to severe food insecurity' in 2022 with a tenth of the global population facing persistent hunger. This situation was reportedly worsened by food prices inflation in 60% of the countries in the world caused by conflicts and disruption to the traditional supply chain. The report also painted a grim picture of global hunger, food insecurity and malnutrition with the likelihood of 19.5% of children of age 5 being affected by stunted growth by the 2030 target year. Thus forecast was based on current trend.

Goal No. 3 – Good Health and Well-being:COVID-19 pandemic was implicated in turning back the hitherto recorded progress in life expectancy as well as gains in fighting communicable diseases. This was akin to undoing ten years of progress in achieving some positive feats in life expectancy.

Goal No. 6 – Clean Water and Sanitation: Reports on this goal acknowledged some modest improvements albeit raising concerns about the fate of '2 billion people' likely to live without safely managed drinking water, another '3 billion without safely managed sanitation. These are in addition to a projected 1.4 billion without basic hygiene services. The report disclosed that between 2015 and 2022 access to safely managed drinking water increased from 69% to 73% among the population. Regarding wastewater treatment, reports from 73 countries available for both total wastewater generation and treatment showed that 76% of total wastewater received some treatment. Forty-two countries reported their specific treatment levels and this showed that 60% of total wastewater flows were safely treated up to at least secondary treatment. One hundred and forty countries and territories reported data on household wastewater. Only 53% of these received safe treatment. The report

opined that 'trends in domestic wastewater suggest that little, if any, progress is being made towards the target of halving the proportion of unsafe discharges by 2030. Finally, it reported that as at 2023, data on 91,000 water bodies from one hundred and twenty countries showed that only 56% had good water quality.

Goal No. 14 – Life Below Water: Aquatic plants have direct correlation to the dynamics of underwater life. Hence, this aspect of the report bears great significance to the subject in this paper. The report stated that 3 billion people depend on the oceans, which cover over 70% of the Earth's surface, for food and livelihoods. The oceans were also noted as crucial in combating effects of climate change. However, eutrophication, aggravating acidification, declining fish stock, rising temperatures and widespread pollution have all been identified as posing significant challenges to the oceans. Emission of CO_2 is particularly responsible for ocean acidification which threatens the oceans biotic communities.

Goal No. 15 – Life on Land: The terrestrial ecosystem is about the most crucial to all of us and its sustainable use also remains crucial as well for our survival. Some of the challenges facing us on earth at the moment include deforestation, desertification, land degradation, and loss of biodiversity due to largely anthropogenic factors. The report acknowledged that these challenges could 'jeopardize the delicate balance of our ecosystem'.

The Owena River Aquatic Plants

1. *Ipomoea aquatica* Forssk (Fig. 1A)–This belongs to the Convolvulaceae family of Angiospermae. This is a floating-leaved perennial herb with spongy stem and straggling. It produces roots at each node. The leaves are borne on long stalks that are almost as long as the leaves. The leaves are triangular, 10cm in length and 7cm wide. They are cordate at the base. It forms floating sudds when growing with in association with other macrophytes. It belongs to a family of plants important as sources of food, drugs, and ornamentals. Taxonomically, it is described as a glabrous trailer on ground or floating on water, stem hollow, rooting at the nodes. Leaves 5-12.5 cm long, ovate, ovate-oblong, deltoid, lanceolate or linear, base cordate, sagittate or hastate. Flowers 1-few in axillary cymes. Corolla 2.5-5 cm long funnel-shaped, pink of pale lilac. Capsule 8 mm, ovoid to globose (Sultana & MahbuburRahman, 2016). *Ipomoea aquatica* sometimes produces dense, impenetrable masses of vegetation that obstruct the flow of water, and shades out competing plants. It can also grow as a weed in rice paddies (USDA, 2020).This plant was the most dominant species of all the recorded macrophytes on the river in seven out of the nine stations studied in the sample area.
2. *Ludwigia decurrens* Walt(Fig. 1B)– Thisis an emergent annual aquatic plant with sessile or sub sessile leaves and belonging to the family Onagraceae. The stem is glabrous and angled. It is an annual or woody perennial herb that stands upright reaching 2 m of height, with alternate branches. The leaves are opposite, narrowly elliptical, 4–12 cm long, and 1–3 cm wide. A single flower with four bright yellow petals is produced in the upper leaf axis. A seed capsule develops immediately below the flower and contains up to 1000 seeds per capsule (Chandrasena, 1988; Kurniadie, 2021). *L. decurrens* is native to Central Eastern USA but has been introduced accidentally into many countries in South and East Asia and Africa, where it is now considered an invasive noxious weed (Chandrasena, 1988; Barua, 2010; Oyedeji, et al., 2011; Kong, 2019).It occurred as emergent shrubs in the Owena river and was recorded in both dry and rainy seasons.
3. *Azolla pinnata* R. Br. (Fig. 1C) - This is a free-floating plant. It is a green, blue-green, or reddish, free floating fern with triangular fronds belonging to the family Azollaceae. The stem is small and fragile, covered with two rows of tiny overlapping leaves. The roots are up to 3cm long bearing numerous spreading root hairs. Much of Africa, Asia from China to Japan, India and the Philippines, and parts of Australia are home to this species. Since fast currents and waves break up the plant, it flourishes in peaceful, slow-moving water bodies. The cyanobacterium *Anabaena azollae* is found in the leaves, and it is a symbiont that fixes nitrogen from the atmosphere for the fern to use. This allows the fern to thrive in nitrogen-deficient environments (Sood, et al., 2005).
4. *Sacciolepis africana* C. E. Hubb. and Snowden (Fig. 1D) - These species are perennial and have rhizomes or stolons. The inflorescence is usually a narrow, dense panicle. They generally grow in moist habitat, such as stream banks. A rhizomatous perennial grass, with thick spongy culms, decumbent, rooting at lower nodes in swamps and shallow water, across the Region from Senegal to N and S Nigeria, and throughout tropical Africa.The habit of the plant suggests a use in mud-binding in alluvial swamps (Burkill, 1985).This plant occurred at the banks of the study site in the rainy season. It was rare in the dry season.

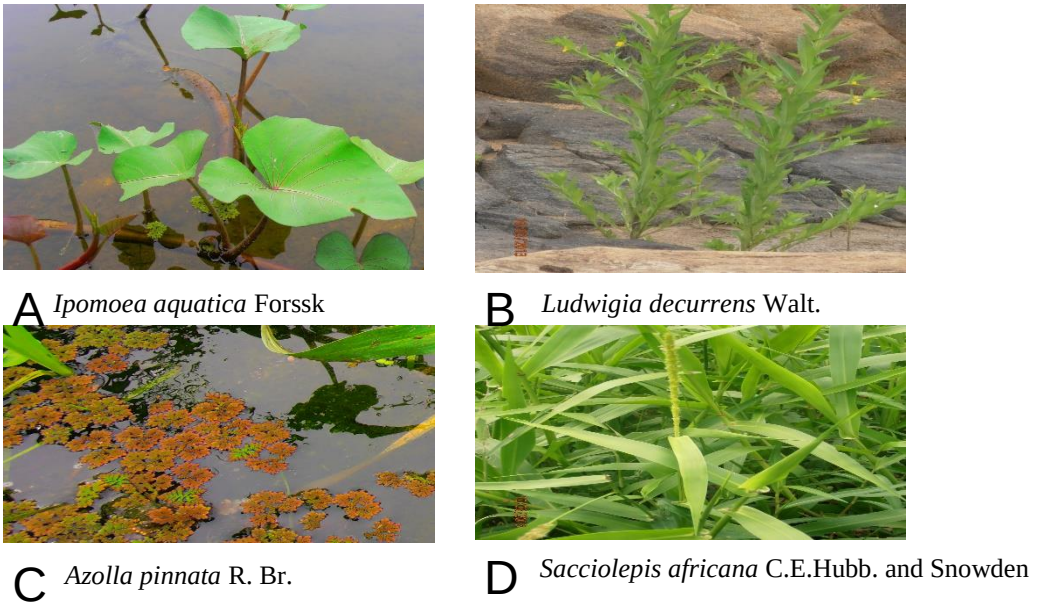


Figure. 1: Four aquatic macrophytes of interest

The potential economic contributions of the aquatic plants to sustainable development

Plants generally have played significant roles in enhancing sustainable life and livelihood of humans on earth. Asides from their contributions to maintaining ecological stability on earth, they have been recorded severally to contribute to economic sustainability. Five of the seventeen goals of the SDGs have been selected in this paper to review the latent contributory roles of four dominant aquaphytes identified at the Owena river, Ondo State, Nigeria.

Zero hunger - It is worth noting that Goal No. 2 focusing on 'Zero Hunger' can accommodate the significant opportunities latent in the plants.Although, some of them have no reported nutritional values for humans directly, however, when incorporated into livestock feeds they contribute indirectly to improvements in human nutrition. *Ipomoea aquatica* (Nari-ka-Sag), according to Sultana &MahbuburRahman (2016) has its leaves and young shoots being used as vegetable.Similarly, *Ipomoea aquatic,* according to Fevria et al. (2021),'is well known by our people as a green vegetable that has a high content of mineral vitamins at a low price and is easy to obtain and its cultivation is also relatively easy'.This was also confirmed from oral interviews conducted with locals during the period of the study at Owena-Idanre in 2014. Igwenyi et al. (2011) found that *Ipomea aquatica* (green kangkong) comprises 51.36% moisture, 38.18% carbohydrate, 1.70% protein, 2.75% ash, 1.20% fibre, and 0.81% fat. Although it was discovered that it is not an excellent source of vegetable oil. The high carbohydrate content demonstrated that the plant material can be an efficient source of energy.By integrating this plant into agricultural and nutritional plans of planners and local residents will surely contribute in some significant ways towards realizing zero hunger and at reasonable cost as well. Ismail et al. (2004) reported that the young terminal shoots of the plant are eaten as green leafy vegetables and in salads. Although there is a paucity of literature on the nutritional benefits of *Sacciolepis africana* to humans, the fact that it, like most other macrophytes, serve as habitat for phytoplankton holds great potential for aquatic animals that feed on those microalgae. Ultimately, the abundance of the latter fills up a niche in the food chain for humans.Similarly, specific nutritional benefits of *Ludwigiadecurrens* Walt.are not widely documented, it's essential to consider the ecological implications of this plant in rice fields. Further research may shed light on its nutritional properties and potential applications.

Azolla pinnata is one of the best alternative feed ingredients as a source of protein because of its symbiotic relationship with the nitrogen-fixing blue-green alga *Anabaena azollae*. According to El-Naggar & El-Mesery (2022), the latter augments the protein content of *Azolla* to 25–30%. It also contains 7–10% amino acids, vitamins

(Beta Carotene, vitamin A, vitamin B12), minerals (calcium, potassium, phosphorus, ferrous, magnesium, copper and antioxidants.Ruminants have some challenges digesting lignin contained in the cell wall of most plants. However, the low lignin content in *Azolla* makes it additionally attractive as green feed supplement in livestock feed, especially for dairy cattle (Prabina and Kumar 2010; Chatterjee et al. 2013). *Azolla* was also reported to contain important amino acids, especially lysine, which is beneficial for animal nutrition hence it can be a helpful source of protein supplementation for a variety of species, including fish, poultry, pigs, and ruminants (Hasan & Chakrabarti, 2009). Improved milk and meat production will, no doubts, contribute significantly to meeting the protein needs of the Nigerian child. According to Anon (1985), it was estimated that one hectare of *Azolla* can provide protein equivalent to 790–1100 kg soybean grains in one month.Farmers and livestock managers can consider incorporating *Azolla* into animal diets to enhance nutrition and promote sustainable livestock production towards achieving goal number two of the SDG.

Good Health and Well-being - Towards achieving goal number three, plants have great potentials as sources of medicines and food supplements required to promote good health and general wellbeing of the human race. Due to the, oftentimes prohibitive, costs of pharmaceutical drugs and their inadequate availability especially in developing countries, people worldwide are resorting to herbal medicines and trado-medical practices. The potency of herbal remedies is due to the presence of phytochemicals in the plants that are capable of producing definite physiological changes on the human body when deployed for certain purposes.It is also noteworthy that the World Health Organization (WHO) has advocated traditional medicine as safe remedies for ailments of microbial and non-microbial origin (Mithraja, et al., 2011).The most important compounds that have been identified of these bioactive phytochemicals of plants are their alkaloids, tannins, flavonoids and phenolic components.

Azolla pinnata (water fern or mosquito fern) offers several health benefits due to its rich nutritional profile. Qoms, et al. (2024) in their study on the health benefits of this plant were able to conclude that it has antihypertensive activity wherein its protein hydrolysates demonstrated antihypertensive effects by inhibiting ACE (angiotensin-converting enzyme) activity and that these hydrolysates can help regulate blood pressure and promote cardiovascular health. In addition, they were also able to discover its antidiabetic properties whereas the hydrolysates inhibit enzymes like DPP-IV, α-glucosidase, and α-amylase, which play a role in blood sugar regulation. This plant is also reportedly rich in antioxidants such as bioactive peptides which are able to scavenge free radicals and protecting against oxidative stress.Antioxidants are essential for good health in general and may lower the chance of developing chronic illnesses.With up to 25–35% protein (dry weight), essential amino acids, vitamins (including A, B-complex, and C), and minerals (such calcium, magnesium, potassium, and phosphorus), *Azolla*can be described as nutrient-dense. It is thus a beneficial supplement that can be added to diets, particularly in areas with a shortage of protein sources.However, consulting a healthcare provider is advised before introducing *Azollapinnata* into people's diet or taking it as a supplement. Although there are encouraging potential benefits, each person's reaction may differ. They are also noted for anticancer and antioxidative natural products (Aboul-Enein, 2014; Chai, 2015). In the case of *Ipomea aquatica,* it is rich in beta-carotene, vitamins A and C, and other essential elements. As antioxidants, these nutrients can aid in the body's reduction of free radicals, hence assisting in the reduction of oxidised cholesterol. Heart attacks, strokes, and clogged arteries can result from the oxidation of cholesterol on blood vessel walls. This is corroborated by Fevria et al. (2021). They also showed protection against hypertoxicity (Alkiyumi, 2012). Studies have also shown the presence of some flavonoids and alkaloids in the plant. Flavonoids are classified as secondary metabolites. Their primary structural component is a benzopyrone ring with phenolic or polyphenolic groups arranged at various locations. The most common places to find them are in fruits, vegetables, flowers, seeds, nuts, stems, grains, and vegetables. Several health advantages of flavonoids include their antiviral, anticancer, antioxidant, and anti-inflammatory qualities. Additionally, they offer cardio- and neuroprotective benefits (Shan et al., 2011; Cavalcante et al., 2020; Ullah, et al. 2020). Plants also produce alkaloids as secondary metabolites. These natural bioactive substances are well known for having nitrogen. Alkaloids primarily function as immunomodulators by controlling certain cytokines (Debnath, et al., 2018; Liu, 2018).

Medicinal plants are fast becoming sustainable and preferablealternatives to conventional pharmaceuticals due to global economic challenges and people's resort to indigenous knowledge and traditions. It is quite expedient to continue to explore capabilities of aquatic plants to fill some gaps in this industry.

Clean Water and Sanitation–There are evidences supporting the roles of aquatic plants in phytoremediation of pollution impacted waters around the world. They not only provide cheap alternatives to

expensive water treatment strategies but also provide, in most cases, safer alternatives or complements to such systems. The risks of residual contaminations from chemicals used in certain conventional systems are highly reduced in phytoremediation strategies.By taking up some of the contaminants as plant nutrients, these plants improve the elimination of pollutants. This is especially true for wastewater from cities and farms, where treatment units of various capacities can be used at the source of contamination (Zimmels, et al., 2004). According to recent study from the 2019–2021 timeframe, wastewater treatment employs a phytoremediation strategy that sets important trends. This is one of the most effective methods for removing contaminants using artificial wetlands with aquatic plants (Palomino, et al., 2022). The studies referenced above, *inter alia*, have proven the potential capabilities, efficiency and cost-effectiveness of aquatic plants (both microphytes and macrophytes) in treatment of waste water. This possibility can be explored and expanded for developing countries. This is more imperative now when, according to Tom, et al.(2021),water scarcity and depletion of natural water resources are the major challenges faced by the world today and especially the developing countries of the world. It is also relevant to state that the Owena river was dammed at the study site for parts of this study as at 2014 for water treatment purposes. However, the dam had collapsed before the study ended in 2016 thus reinforcing the need for exploration of the phytoremediation options in the water management strategies.

Life Below Water **–**Under water lives are equally important for aquatic ecosystems as much as they are for life on terrestrial habitats. This is more so for the human race as we depend on aquatic organisms for food, recreation and even economic reasons. It is believed that the ocean covers around 71% of Earth's surface and supports 90% of the planet's biosphere with only 5% of the ocean explored so far by humans due to its vastness.Similarly, inland waters of the globeinclude lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as bogs, marshes and swamps, which are traditionally grouped as inland wetlands (CBD, 2008).They identified the critical biodiversity of inland waters to include, in addition to the obvious life found under the water, such as fish, a wide variety of "terrestrial" animal species, such as water-birds, as well as semi-aquatic species, such as crocodiles, beavers, and hippopotamuses, as well as plants, such as mangroves, flooded forests, and vegetation found near water bodies. For example, most amphibians reproduce in freshwater.This biodiversity could be threatened by anthropogenic factors. Eutrophication remains a big challenge to aquatic lives and it is commonly caused by nitrogen and phosphorus which are both important ingredients in agricultural fertilizers that run off into water from cultivated lands. Other sources are livestock farm wastes, domestic sewage and industrial wastewater.Eutrophication is the syndrome associated with an excess of macro-nutrients derived from anthropogenic sources, which leads in turn to excess plant growth and the exclusion of less competitive species(O'Hare, 2018). When this happens, it creates an avenue for certain aquatic plants, especially algae, to flourish with the potential to asphyxiate other aquatic lives.

In addressing the two major concerns in the SDG reports on goal number fourteen, i.e. Ocean acidification and Illegal, unreported and unregulated (IUU) fishing, it is believed that a sustainable management of aquatic plants, complementing other plants management, can mitigate carbon emission by taking up the CO_2 which is the cause of acidification of the ocean for photosynthesis. The sustainably managed aquatic plant resources will also provide shelter for the other non-plant lives under water while cleaning out any potentially harmful nutrients via bioaccumulation.In as much as aquatic macrophytes can be used in monitoring eutrophication directly and indirectly by measuring epiphytic algal biomass (Hilton et al. (2006), their dominance in any aquatic habitat should be a pointer to the health of such water for other aquatic organisms. This is congruent to the European Union EU Water Framework Directive (WFD) (EC, 2024).

Life on Land **–** The ultimate contributions of aquatic plants to life on land rest heavily on their capacity for biological productivity and sustenance of biodiversity in the aquatic ecosystems. Their resource potential as raw materials for biofuel production has also been the subject of many experimental studies (Kumar, 2020; Miranda, et al., 2020;Arefin, et al., 2021; Nahar&Sanwar, 2024). Their contributions to carbon control and oxygen provision are invaluable (Caraco, 2006). NASA opined that "plants on land and in the ocean convert carbon dioxide to biomass (like leaves and stems) through photosynthesis. The carbon returns to the atmosphere when the plants decay, are eaten and digested by animals, or burn in fires."

4.0 CONCLUSION

Nigeria as a member nation has also set up an SDG office responsible for monitoring progress and coordination of the country's programmes aimed at achieving some of the goals. While funding may pose significant challenges, it is believed that there are some low-hanging fruits that can be exploited to accelerate our progress as

a Nation. The abundant aquatic plant resources are an example of such low-hanging fruits that could provide sustainable alternatives to the somewhat expensive options that could debar progress. Their ubiquitous presence and abundance makes them economically important.Their tested and viable efficacy in providing medicinal values, as well as potential to serve as human food and animal fodders are likely to contribute to Nigeria's progress in attaining significant progress in the highlighted goals in this paper.

REFERENCES

Aboul-Enein, A. M., Shanab, S. M., Shalaby, E. A., Zahran, M. M., Lightfoot, D. A., & El-Shemy, H. A. (2014). Cytotoxic and antioxidant properties of active principals isolated from water hyacinth against four cancer cells lines. *BMC complementary and alternative medicine*, *14*, 1-11.

Alkiyumi, S. S., Abdullah, M. A., Alrashdi, A. S., Salama, S. M., Abdelwahab, S. I., &Hadi, A. H. A. (2012). Ipomoea aquatica extract shows protective action against thioacetamide-induced hepatotoxicity. *Molecules*, *17*(5), 6146-6155.

Anon (1985) Propagation and agricultural use of Azolla in Vietnam. FAO-AGPIRC/85/7(bl). International Rice Commission Sess. 16. Los Banos, The Philippines. FAO, Rome, Italy

Arefin, M. A., Rashid, F., & Islam, A. (2021). A review of biofuel production from floating aquatic plants: an emerging source of bio-renewable energy. *Biofuels, Bioproducts and Biorefining*, *15*(2), 574-591.

Barua, I.C. (2010). The genus *Ludwigia* (Onagraceae) in India. *Rheedea*, *20*, 59–70.

Bhateria, R., & Jain, D. (2016). Water quality assessment of lake water: a review. *Sustainable water resources management*, *2*, 161-173.

Bornette, G. &Puijalon, S. (2011). Response of aquatic plants to abiotic factors: a review. *Aquatic Science*, *73*: 1-14.

Burkill, H.M. (1985). *The useful plants of west tropical Africa, Vol 2.* Royal Botanic Gardens. 648 pages.

Caraco, N., Cole, J., Findlay, S., & Wigand, C. (2006). Vascular Plants as Engineers of Oxygen in Aquatic Systems, *BioScience*, *56*(3), 219–225. https://doi.org/10.1641/0006-3568(2006)056[0219:VPAEOO]2.0.CO;2

Cavalcante, G. M., da Silva Cabral, A. E., & Silva, C. C. (2018). Leishmanicidal Activity of Flavonoids Natural and Synthetic: A Minireview. *Mintage J. Pharm. Med. Sci*, *7*(1), 25-34.

Chai, T. T., Ooh, K. F., Quah, Y., & Wong. F. C. (2015). Edible freshwater macrophytes: a source of anticancer and antioxidative natural products—a mini-review. *Phytochem Rev*. *14*, 443–457. https://doi.org/10.1007/s11101-015-9399-z

Chander, M.(2011). Azolla: A sustainable animal feed?. In: Makkar, H. P. S. (Ed). Successes and failures with animal nutrition practices and technologies in developing countries. FAO Electronic Conference, 1-30 September 2010. FAO Animal Production and Health, N° 11. FAO, Roma

Chandrasena, J.P.N.R. (1988).*Ludwigiadecurrens* Walt. A new rice-field weed in Sri Lanka. *J. Natl. Sci. Found. Sri Lanka*, *16*, 97–103.

Chatterjee, A., Sharma, P., Ghosh, M. K., Mandal, M., & Roy, P. K. (2013). Utilization of Azollamicrophylla as feed supplement for crossbred cattle. *International Journal of Agriculture and Food Science Technology*, *4*(3), 207-214.

Clayton, W.D. & Renvoize, S.A. 1982. *Gramineae (Part 3).* In Polhill, R.M. (ed.), *Flora of Tropical East Africa 80*(3): 451–898. Balkema, Rotterdam. ISBN 90-6191-303-9

Convention on Biological Diversity (CBD). (2008). Inland Waters Biodiversity - What is It?https://www.cbd.int/waters/inland.

Debnath, Bikash& Singh, Somraj& Das, Manik&Goswami, Sanchari& Singh, Mahesh &Maiti, Debasish& Manna, Kuntal. (2018). Role of plant alkaloids on human health: *A review of biological activities*, *9*, 56 – 72.

Ecoport, (2011). Ecoport database. Ecoport.

Egertson, C. J.,Kopaska, J. A., & Downing, J. A. (2004). A century of change in macrophyte abundance and composition in response to agricultural eutrophication. *Hydrobiologia*, *524*: 145-156.

El Naggar, S. & El-Mesery, H.S. (2022). *Azollapinnata* as unconventional feeds for ruminant feeding. *Bull Natl Res Cent 46*, 66.

European Commission (2024, July 27). *Water Framework Directive.*https://environment.ec.europa.eu/topics/water/water-framework-directive_en

Fevria, R., Aliciafarma, S., Vauzia, & Edwin (2021). Comparison of Nutritional Content of Water Spinach (*Ipomoea aquatica*) Cultivated Hydroponically and Non-Hydroponically. *Journal of Physics*. doi:10.1088/1742-6596/1940/1/012049

Garwa, H., & Veerwal, B. (2024). Sustainable Development of Organic Farming using Water Hyacinth *Pontederiacrassipes* over Vermitechnology by *Eiseniafetida*: A Review. *Current Agriculture Research Journal, 12* (1) .https://doi.org/10.12944/CARJ.12.1.04

Guterres, A. (2024). Foreword. In: *The Sustainable Development Goals Report 2024.* United Nations, New York.

Hasan, M. R. &Chakrabarti, R. (2009). *Use of algae and aquatic macrophytes as feed in small-scale aquaculture: A review*. FAO Fisheries and Aquaculture technical paper, 531. FAO, Rome, Italy

Igwenyi, I. O., Offor, C. E., Ajah, D. A., Nwankwo, O. C., Ukaomah, J. I. & Aja, P. M. (2011). Chemical Composition of *Ipomeaaquatica* (Green kangkong). *International Journal of Pharma and Bio Sciences, 2*(4), 593-598.

Ismail, A., Marjan, Z. M., &Foong, C. W. (2004). Total antioxidant activity and phenolic contents in selected vegetables. *Food Chem. 87*, 581 – 586.

Ita, E. O. ,(1994). Aquatic plants and wetland wildlife resources of Nigeria.CIFA occasional paper. CIFA/OP21. 52p.

Jafari, N., (2010). Ecological and socio-economic utilization of water hyacinth (*Eichhorniacrassipes* Mart Solms). *J. Appl. Sci. Environ. Manage.*,*14*(2), 43-49.

Khankhane P. J.,&Varshney, J. G. (2009). Impact of municipal waste water irrigation on weed infestation in wheat and cauliflower. In Abstracts of National Symposium on Weed Threat to Environment, Biodiversity and Agricultural Productivity held during 2-3 August,2009 at TNAU, Coimbatore : p133

Khankhane P. J.,&Varshney, J. G. (2009).Performance of Sub-surface Horizontal Wetland Model using *Arundodonax* for Rhizofiltration of Drain water. *International Journal of Sciences & Applied Research, 2*(10), 53-59.

Kong, L. P., Peng, Y. F., You, K., Peng, H. H., &Wang, G. H. (2019). *Ludwigiadecurrens*Walt., a naturalized hydrophyte in mainland China. *J. Trop. Subtrop. Bot., 27*, 338–342.

Kumar, N. (2020). *Environmental Concerns and Sustainable Development*. V. Shukla (Ed.). Singapore: Springer.

Kurniadie, D., Widianto, R., Widayat, D., Umiyati, U., Nasahi, C., & Kato-Noguchi, H. (2021). Herbicide-resistant invasive plant species ludwigiadecurrenswalter. *Plants, 10*(9). https://doi.org/10.3390/plants10091973.

Liu, W., Zhang, Y., Zhu, W., Ma, C., Ruan, J., Long, H., & Wang, Y. (2018). Sinomenine inhibits the progression of rheumatoid arthritis by regulating the secretion of inflammatory cytokines and monocyte/macrophage subsets. *Frontiers in immunology*, *9*, 2228.

Mithraja, M. J., Johnson, M., Mahesh, M., Paul, Z. M., &Jeeva, S. (2011). Phytochemical studies on *Azollapinnata* R. Br., *Marsileaminuta* L. and *Salviniamolesta* Mitch. *Asian Pacific Journal of Tropical Biomedicine*, *1*(SUPPL. 1). https://doi.org/10.1016/S2221-1691 (11)60116-0

Miranda, A. F., Kumar, N. R., Spangenberg, G., Subudhi, S., Lal, B., &Mouradov, A. (2020). Aquatic plants, *Landoltiapunctata*, and *Azollafiliculoides* as bio-converters of wastewater to biofuel. *Plants*, *9*(4), 437.

Muhammad, N. , Andi, B. R., Muhammad, N., Ahmad, Y., Rizal, I., Hilmi, M. B., Siti, F., Nur, I. A., Ayu, S. A., ViviDia, A. S., &Syamsu, R. (2024). Efficiency of Water Hyacinth (*Eichhorniacrassipes*) in the Phytoremediation of Copper Contaminated Waters of Lake Tempe, South Sulawesi Indonesia. *International Journal of Design & Nature and Ecodynamics*, *19* (3), 1081-1087.

Muller-Feuga, A.(2013). Microalgae for aquaculture: the current global situation and future trends. In: Richmond, A., Qiang Hu (Eds), 2013, Handbook of microalgal culture: applied phycology and biotechnology, 2nd edition, Wiley-Blackwell: 615-627.

Mustafa, M. M., MohdKasim, M. M., Ali, N. A. L. M., Zakaria, S. N. F., &MohdZamri, M. F. A., (2024). The effect of Ancholla flake on the growth of red tilapia (*Oreochromisniloticus*). *International Journal of Progressive Research in Engineering Management and Science* (*IJPREMS*), *04*(06), 1840-1845.

Mwale, M.,&Gwaze, F. R.(2013). Characteristics of duckweed and its potential as feed source for chickens reared for meat production: a review. *Scientific Research and Essays, 8* (18): 689-697.

Nahar, K. &Sanwar, A. S. (2024). Co-Benefits of *EichhorniaCrassipes* (Water Hyacinth) as Sustainable Biomass for Biofuel Production and Aquatic Ecosystem Phytoremediation. *Fuels , 5*(3), 317-333; https://doi.org/10.3390/fuels5030018

National Aeronautics and Space Administration (NASA). (2024, July 24).Carbon Cycle and Ecosystems.

https://terra.nasa.gov/science/carbon-cycle-and-ecosystems.

National Oceanic and Atmospheric Administration. (2023, January 20). NOAA. What is eutrophication? National Ocean Service website, https://oceanservice.noaa.gov/facts/eutrophication.html, 1/20/23.

O'Hare, M. T. ,Baattrup-Pedersen, A., Baumgarte, I., Freeman, A., Gunn. I. D. M., Lázár, A. N., Sinclair, R., Wade, A. J., Bowes, M. J. (2018). Responses of Aquatic Plants to Eutrophication in Rivers: A Revised Conceptual Model. *Frontiers in Plant Science, 9.*

Oweibia, M., Elemuwa, U. G., Akpan, E., Daniel, E. T., Oruikor, G. J., Tarimobowei, E., Okoho, E. E., Elemuwa, C. O., Raimi, M. O., &Babatunde, A. (2024). Analyzing Nigeria's Journey Towards Sustainable Development Goals: A Comprehensive Review From Inception to Present. *Qeios*. https://doi.org/10.32388/8o5qeg

Oyakhilome, G. I., Aiyesanmi, A. F. andAkharaiyi, F. C. 2012. Water Quality Assessment of the Owena Multi-Purpose Dam, Ondo State, Southwestern Nigeria. *Journal of Environmental Protection3*(1), 14-25.

Oyedeji, O., Oziegbe, M., &Taiwo, F. O. (2011). Antibacterial, antifungal and phytochemical analysis of crude extracts from the leaves of *Ludwigiaabyssinica* A. Rich. and*Ludwigiadecurrens* Walter. *J. Med. Plants Res*., *5*, 1192–1199.

Palomino S. Y., Vilchez, G. L., Matencios, C. C., Cornejo, T. J., Camargo, H. S., & Canales, G. V. (2022). Systematic Review of the Efficiency of Aquatic Plants in the Wastewater Treatment. *IOP Conference Series: Earth and Environmental Science*, *1009*(1). https://doi.org/10.1088/1755-1315/1009/1/012004

Pereira, P., Inácio, M., Pinto, L., Kalinauskas, M., Bogdzevic, K., & Zhao, W. (2024). Mapping ecosystem services in urban and peri-urban areas. A systematic review. *Geography and Sustainability*. https://doi.org/10.1016/j.geosus.2024.06.002

Prabina, B. J., & Kumar, K. (2010). Dried *Azolla* as a nutritionally rich cost effective and immuno-modulatory feed supplement for broilers. *Asian J AnimSci 5*:20–22.

Qoms, M.S., Arulrajah, B., Ibadullah, W.Z.W., Ramli, N. S., Shamsudin, R., Chau , D., &Saari , N.(2024). Antihypertensive, Antidiabetic, and Antioxidant Properties of Novel *Azollapinnata* Fern Protein Hydrolysates: Inhibition Mechanism, Stability, Profiling, and Molecular Docking. *Food Bioprocess Technol* .https://doi.org/10.1007/s11947-024-03412-1

RakibulHasan, B. M., Shaiful Islam,Md., Kundu, P., Mallick, U. K.,&Phang, C., (2023). "Modeling the Effects of Algal Bloom on Dissolved Oxygen in Eutrophic Water Bodies," *Journal of Mathematics, Hindawi*, *2023*, 1-20.

Sanni, R. O. (2021). Seasonal changesin the aquatic plant community and primary productivity of the Owena dams in Ondo state, Nigeria.Unpublished Ph.D thesis. University of Ibadan, Ibadan. Nigeria.

Shan, X., Cheng, J., Chen, K., Liu, Y. M., & Juan, L. (2017). Comparison of lipoxygenase, cyclooxygenase, xanthine oxidase inhibitory effects and cytotoxic activities of selected flavonoids. *DEStech Trans. Environ. Energy Earth Sci*, *10*.

Sinbuathong, N., Sombat, N., &Meksumpun, S. (2020). Comparison of the increase in methane yield using alkali pretreatment for French weed and water lettuce prior to co-digestion. *Environmental Progress & Sustainable Energy*, *39*(4), e13361.

Sood, A., Ahluwalia, A.S. andDua, S. 2005. Indicators of phosphorus deficiency in Azollapinnata(Salviniales, Pteridophyta). *ActaBotanicaHungarica47*, 1-2 197.

Sood, A.,Uniyal, P. L.,Prasanna, R., & Ahluwalia, A. S. (2012). Phytoremediation potential of aquatic macrophyte, *Azolla*. *Ambio*.,*41*(2), 122–137.

Sultana, R. &MahbuburRahman A. H. M. (2016). Convolvulaceae: A taxonomically and medicinally important morning glory family. *International Journal of Botany Studies*, *1*(3) 47-52.

Tamizhkumaran, J.,&Rao, S. V. N. (2012). Why cultivation of *Azolla*as cattle feed not sustainable?*Indian J. Dairy Sci*., *65*(4): 349-353.

Tom, A. P., Jayakumar, J. S., Biju, M., Somarajan, J., & Ibrahim, M. A. (2021). Aquaculture wastewater treatment technologies and their sustainability: A review. *Energy Nexus*, *4*, https://doi.org/10.1016/j.nexus.2021.100022

Ullah, A., Munir, S., Badshah, S. L., Khan, N., Ghani, L., Poulson, B. G., Emwas, A. H., &Jaremko, M.

(2020). Important Flavonoids and Their Role as a Therapeutic Agent. *Molecules (Basel, Switzerland)*, *25*(22), 5243. https://doi.org/10.3390/molecules25225243

United Nations General Assembly and Social Council, (2024). Progress towards the Sustainable Development Goals: Report of Secretary General. https://unstats.un.org/sdgs/files/report/2024/SG-SDG-Progress-Report-2024-advanced-unedited-version.pdf

United States Department of Agriculture, (2020). *Weed Risk Assessment for Ipomoea aquaticaForssk. (Convolvulaceae) – Water spinach*. 20pp

Van Hove, C., & Lejeune, A.(1996). Does *Azolla* have any future in agriculture? In: Biological Nitrogen Fixation Associated with Rice Production (Rahman M, Podder AK, Van Hove C, Begum ZNT, Heulin T and Hartmann A eds.) pp. 83-94. Kluwer Academic Publishers.

Wu, W., & Sun Y.(2011). Dietary safety evaluation of water hyacinth leaf protein concentrate. *Hum. Exp. Toxicol.*, *30*(10), 1514-1520.

Xibu, C. (2022). Aquatic plants: benefits and challenges in maintaining ecosystem health. *Advances in fishery, aquaculture and hydrobiology*, *10*(4), 05. https://creativecommons.org/licenses/by-nc-nd/4.0/

Zhao, C., Liu, S., Zhang, X., Meng, E., Tang, Y., Fen, Z., Liu, Y., &Macreadie, P. I. (2024). Evidence of nitrogen inputs affecting soil nitrogen purification by mediating root exudates of salt marsh plants. *Science of The Total Environment*, 174396. https://doi.org/10.1016/J.SCITOTENV.2024.174396

Zimmels, Y., Kirzhner, F., &Roitman, S. (2004). Use of naturally growing aquatic plants for wastewater purification. *Water environment research : a research publication of the Water Environment Federation*, *76*(3), 220–230. https://doi.org/10.2175/106143004x141762

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

EMERGING TECHNOLOGICAL INNOVATIONS AND THE RISING TRAJECTORY OF THE SERVICE SECTOR IN SELECTED AFRICAN COUNTRIES: THE YEAR 2000 TO 2023

***[1]Tayo Isaiah Adebimpe & [1]Sarah Olanrewaju Anyanwu**
[1]Department of Economics, Faculty of Social Sciences, University of Abuja, FCT Abuja.
*Corresponding Authors' Email addresses: tyadebimpe@gmail.com; sarahanyanwu2003@yahoo.com

ABSTRACT
This study examines the interplay between emerging technological innovations and the rising trajectory of the service sector in five African countries: DR Congo, Egypt, Kenya, Nigeria, and South Africa, covering the year 2000 to 2023. The study investigates the impact of emerging technologies proxy digital economy index (DEI), service sector employment (SSE), government expenditure, human capital, labour force ratio, level of investment, and total factor productivity on the service sector growth (SSG). The Autoregressive Distributed Lag (ARDL) model was employed to analyse the data. Emerging technologies are surprisingly found not to be responsible for the current expansion of the service sector, as the digital economy does not exert a statistically significant long-run influence on service sector growth in any of the countries (all p-values > 0.05) except DR Congo in the short-run although it is positively related. However, an upsurge in service sector employment is positively associated with the service sector growth across all the countries. This association is statistically significant in Kenya (8.9717; p-value = 0.0148) and Nigeria (5.2159; p-value = 0.0030). This suggests that the current progressing growth of the service sector and its emergence as the largest contributor to the gross domestic product (GDP) of these African countries is attributable to the number of employments the sector is creating. Hence, there is a need to promote and committedly create enabling environments for the development and adoption of emerging technological innovations in these countries to harness the productivity gains that come with the emerging technological innovations in Africa.

***Keywords*:** *Digital economy, emerging technologies, and service sector.*

1.0 INTRODUCTION
Technological innovations have through economic history and the civilization of man been responsible for the dynamic nature of markets, business operations, and our lifestyles, causing both economic and social changes. They have always altered and keep altering the markets, the society, and our way of living (Wang, 2023). Economic activities and structure of economies have never remained the same since man began crop domestication and cultivation in 8,000 BC (Tames, Lincoln, and Matthews, 2020). Economies have changed and they keep changing at the rate and pace of the emergence of new technological innovations. Starting from the invention of hand tools by cavemen to steam-powered engines in the 18th century to telegraphs, internal combustion engines, and electricity to computerization; mainframes, PCs, the internet, smartphones, social networking, cloud computing, big data, blockchain to artificial intelligence and now artificial superintelligence, man and his ways of conducting economic activities keep advancing as a result of emerging technological innovations (Wang, 2023).

As technological advancements continue to revolutionize industries and sectors, the structure of economies keeps changing. The service sector which was referred to as stagnant, less progressive, whose growing share was described as unfavourable to economic growth rate and would decline productivity gains during the industrial age (Baumol 1967, 1985) has conversely emerged as the leading contributor to most national economies (World Bank, 2017; UNCTAD, 2015; 2017; WTO, 2019). The adoption of emerging digital technologies such as digital platforms, cloud computing, big data analytics, and the incorporation of artificial intelligence have been identified to improve service delivery, efficiency, and transformation of the service sector (Küfeoğlu, 2022).

In Africa, the service sector is fast expanding and has been reported as the fastest growing and the leading sector of many African countries. UNCTAD (2015) reported that in many African countries, the service sector has become the largest contributor to the economy and the sector has been growing steadily, even displacing the all-time growth-generating sectors, the agricultural and industrial sectors. According to the

World Trade Organization (WTO, 2019), the service sector has emerged as the most dynamic sector. Over the last three decades, its contribution to GDP has surged from 64% to 72% in developed countries and from 46% to 50% in developing nations including Africa. Consequently, this growth has seen the sector generating about 35% of formal employment within developing economies and up to 84% in developed economies (World Bank, 2023). The continent has witnessed a remarkable adoption of a number of these emerging technologies, digital infrastructure, wide usage of different generations of smartphones, digital devices, and internet connectivity starting from cellular network to 2G to 3G to 4G and currently 5G over the past two decades.

Emerging technological innovations are found in various fields of human endeavours, they are wide in scope and applications. Most of the emerging technologies of today have digitization as their key feature, they leverage the pervasive power of digitization and information technology meaning most emerging technological innovations of today are built on digital power (Schwab, 2016). How has the use of these emerging technologies contributed to the growth being witnessed in the sector in Africa? Is the digital economy behind the emergence of the service sector as the largest and the leading contributor to national GDPs? Hence, this study intends to investigate the impact of these emerging technologies on the ongoing expansion of the service sector in Africa by selecting the leading digital economy nation of each of the five regions of Africa according to a survey by the European Investment Bank (2021); Nigeria in the West, Kenya in the East, Egypt in the North, Democratic Republic of Congo in the Central and South Africa in the South of Africa.

2.0 METHODOLOGY

Therefore, this study limits its scope to emerging digital technologies and uses the digital economy index of each country to capture the diffusion of emerging technologies in that economy and regress that on the growth of the service sector in these countries to find out how emerging technologies vis-à-vis the digital economy have impacted the growth of the service sector of these countries. This study employs Principal Component Analysis (PCA) to develop an index for the digital economy of each country and Autoregressive Distributed Lag (ARDL). The choice of this estimation technique was informed by the occurrence of mixture of I (0) and I (1) stationarity property of the time series and the study's objective to investigate both the short-run and the long-run impacts of the emerging technological innovations proxy the digital economy on the current expansion of the service sector in Africa.

2.1 MODEL SPECIFICATION

The endogenous growth theory, developed by Romer (1986) and Lucas (1988), can be represented by the following equation:

$Y = AK^{\alpha} H^{\beta}$

(1.0)

Where:

- Y = Output or GDP
- A = Total factor productivity
- K = Physical capital
- H = Human capital (education, skills, etc.)
- α = Elasticity of output with respect to physical capital
- β = Elasticity of output with respect to human capital

This equation shows that output (Y) is a function of total factor productivity (A), physical capital (K), and human capital (H). The parameters α and β represent the elasticity of output for physical and human capital, respectively.

Taking the logarithm of equation 1.0, the Endogenous Growth model underpinning this work, we linearise the equation to as:

$InY = InA + \alpha InK + \beta InH$

(2.0)

Where the log of output InY is service sector growth (), log of total productivity InA is digital economy(DEI) proxy for emerging technological innovations, physical capital K and human capital H are control variables represented by (Xs) equation 2.0 becomes:

$$Ssg_{it} = \beta_0 + \beta_1 DEI_{it} + \sum_{1=i}^{n} \lambda X + \varepsilon_t$$

(3.0)

This is in line with the models of James et al., (2023) and Zhang et al., (2021) for service sector growth and digital economy.

Expanding equation 3.0 with control variables; domestic credit to the private sector, gross fixed capital formation, rate of gross capital formation, government expenditure, human capital, labour force, and total factor productivity as capital and labour components of the Endogenous Growth model through the external demand shock term Δ_I to yield a standard ARDL model in equation 1.0 as follows:

$$LSSG_{it} = \alpha_0 + \beta_1 LSSG_{i,t-1} + \beta_1 DEI_{1,i,t-1} + \beta_1 DCP_{1,i,t-1} + \beta_1 GFCF_{1,i,t-1} + + \beta_1 RGCF_{1,i,t-1} + \beta_1 GE_{1,i,t-1} + \beta_1 SSE_{1,i,t-1} + \beta_1 HDI_{1,i,t-1} + \beta_1 LFR_{1,i,t-1} + \beta_1 TFP_{1,i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta LSSG_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta DEI_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta DCP_{i,t-1} + + \sum_{j=1}^{q-1} \alpha_{0j} \Delta GFCF_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta RGCF_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta GE_{i,t-1} + + \sum_{j=1}^{q-1} \alpha_{0j} \Delta SSE_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta HC_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta LFR_{i,t-1} + \sum_{j=1}^{q-1} \alpha_{0j} \Delta TFP_{i,t-1} + \lambda ETC_{i,t-1} + \varepsilon_{it} \quad (4.0)$$

Where:

SSG is service sector growth, DEI is a digital economy index, a proxy for emerging technological innovations, DPC is domestic credit to the private sector, GFCF is the gross fixed capital formation and RGCF is capital formation growth rate, a proxy for level of investment, GE is government expenditure, SSE is service sector employment, HDI is human development index, a proxy for human capital, LFR is labour force rate and TFP is total factor productivity

2.1 FIGURES AND TABLES

Table 1 presents the fifteen indicators used for the computation of the digital economy indexes for DR Congo, Egypt, Kenya, Nigeria, and South Africa respectively.

Table 1: Computation Of Digital Economy Index

	Indicator Definition	
DEI		Digital Economy Index
Indicator 1	**3GNC:**	The proportion of the population covered by at least a 3G mobile network
Indicator 2	**ATM_100K:**	Automated teller machines (ATMs) (per 100,000 adults)
Indicator 3	**CCSE:**	Communications, computer, etc. (% of service exports, BoP)
Indicator 4	**CCSI:**	Communications, computer, etc. (% of service imports, BoP)
Indicator 5	**EPCC:**	Electric power consumption (kWh per capita)
Indicator 6	**FBP_100:**	Fixed broadband subscriptions (per 100 people)
Indicator 7	**HTE:**	High-technology exports (% of manufactured exports)
Indicator 8	**ICTGE:**	ICT goods exports (% of total goods exports)
Indicator 9	**ICTGI:**	ICT goods imports (% total goods imports)
Indicator 10	**ICTSE:**	ICT service exports (% of service exports, BoP)
Indicator 11	**MCS:**	Mobile cellular subscriptions (per 100 people)
Indicator 12	**PIP:**	Percentage of Internet Penetration
Indicator 13	**SIS:**	Secure Internet servers (per 1 million people)
Indicator 14	**SIUI:**	Share of Individuals Using Internet
Indicator 15	**HISC:**	High-speed internet subscriptions of 10mbps and above

3.0 RESULTS AND DISCUSSION

DR CONGO

Tables 2 and 3 present the results of the short-run and long-run estimations for DR Congo.

Table 2: Short-Run Estimation for Dr Congo

Dependent Variable: D(SSG)
Method: Least Squares
Date: 07/26/24 Time: 17:08
Sample (adjusted): 2002 2023
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.414311	0.373920	1.108021	0.3001
D(SSG(-1))	0.023463	0.092031	0.254948	0.8052
D(DEI)	0.763665	0.224201	3.406166	0.0093
D(DEI(-1))	0.294143	0.309888	0.949190	0.3703
D(SSE)	-0.248099	0.342099	-0.725225	0.4890
D(SSE(-1))	1.179488	0.650527	1.813126	0.1074
D(DCP(-1))	0.200644	0.308692	0.649980	0.5339
D(GE(-1))	0.024645	0.007693	3.203750	0.0125
D(GFCF(-1))	0.047708	0.049707	0.959792	0.3653
D(HDI(-1))	43.43624	80.88839	0.536990	0.6059
D(LFR(-1))	727.8524	154.7799	4.702501	0.0015
D(RGCF(-1))	-0.011160	0.005326	-2.095278	0.0694
D(TFP(-1))	-0.274604	0.219701	-1.249898	0.2467
ECM(-1)	-1.418119	0.178928	-7.925627	0.0000

R-squared	0.955342	Mean dependent var	-0.148472
Adjusted R-squared	0.882774	S.D. dependent var	2.187134
S.E. of regression	0.748838	Akaike info criterion	2.520538
Sum squared resid	4.486065	Schwarz criterion	3.214838
Log likelihood	-13.72592	Hannan-Quinn criter.	2.684094
F-statistic	13.16467	Durbin-Watson stat	2.008871
Prob(F-statistic)	0.000534		

Table 3: Long-Run Estimation for Dr Congo

Dependent Variable: SSG				
Method: ARDL				
Date: 05/11/24 Time: 14:41				
Sample (adjusted): 2001 2023				
Included observations: 23 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): DEI DCP SSE GE GFCF HDI				
LFR RGCF TFP				
Fixed regressors: C				
Number of models evaluated: 512				
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 1, 1, 0, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SSG(-1)	-0.849169	0.258407	-3.286176	0.0111
DEI	0.717323	0.800131	0.896507	0.3962
DCP	0.642335	0.930353	0.690420	0.5095
SSE	0.380051	1.764747	0.215357	0.8349
SSE(-1)	4.153908	2.724090	1.524879	0.1658
GE	-0.008107	0.030209	-0.268378	0.7952
GFCF	0.325110	0.139645	2.328109	0.0483
HDI	-467.8135	282.8123	-1.654148	0.1367
HDI(-1)	271.0975	245.3906	1.104759	0.3014
LFR	-210.2488	224.5042	-0.936503	0.3764
LFR(-1)	1901.688	664.9323	2.859973	0.0212
RGCF	-0.020955	0.022381	-0.936295	0.3765
TFP	0.371742	0.664827	0.559156	0.5914
TFP(-1)	-1.244509	0.609942	-2.040373	0.0756
C	-594.6307	163.7214	-3.631966	0.0067
R-squared	0.951577	Mean dependent var		36.13045
Adjusted R-squared	0.866836	S.D. dependent var		4.139336
S.E. of regression	1.510514	Akaike info criterion		3.911072
Sum squared resid	18.25321	Schware criterion		4.651611
Log-likelihood	-29.97733	Hannan-Quinn criteria.		4.097315
F-statistic	11.22924	Durbin-Watson stat		2.182699
Prob(F-statistic)	0.000912			
*Note: p-values and any subsequent tests do not account for the model selection.				

expenditure

Short-Run Estimation Result Interpretation and Discussion

Digital economy: The positive and statistically significant coefficient of the Digital economy (0.7637) confirms that emerging technological innovations, as proxied by DEI, positively and significantly influence short-run service sector growth. This implies that advancements in technology drive growth in the service sector in DR Congo.

Government Expenditure: The positive and statistically significant coefficient of D(GE(-1)) (0.0246) suggests that past increases in government positively impact current service sector growth. This could indicate government spending's role in stimulating economic activity, including the service sector.

Labour Force Ratio: The positive and highly statistically significant coefficient of D(LFR(-1)) (727.8524) implies that changes in the labour force ratio strongly influence short-run service sector growth. A larger labour force can potentially contribute to increased service sector output.

ECM(-1): The negative and highly statistically

significant coefficient of ECM(-1) (-1.4181) confirms the presence of a long-run relationship among the variables and indicates a relatively fast adjustment towards the long-run equilibrium.

Long-Run Estimation Result Interpretation and Discussion

Lagged service sector growth: The negative and statistically significant coefficient (-0.849169, p-value = 0.0111) indicates that past values of SSG (error correction term) have a significant negative impact on current SSG. Service Sector Employment (SSE) with a one-period lag shows a positive coefficient (4.153908) but is not statistically significant (p-value = 0.1658). This suggests a possible positive relationship between lagged employment and future service sector growth.

The lagged Labour Force Ratio (LFR) has a positive and statistically significant coefficient (1901.688, p-value = 0.0212). This indicates that a higher labour force ratio in the previous period leads to a significant increase in service sector growth in the current period.

Gross Fixed Capital Formation (GFCF) has a positive and statistically significant coefficient (0.325110, p-value = 0.0483), suggesting that higher investment leads to higher service sector growth in the long run.

Total Factor Productivity with a one-period lag has a negative coefficient (-1.244509) and no significant p-value (0.0756). This hints at a potential decrease in service sector growth in the long run due to increased productivity possibly due to job displacement by automation. However, the significance level is weak.

Digital Economy, DCP (Domestic Credit to Private Sector), SSE (current employment), GE (Government Expenditure), HDI (Human Capital), HDI(-1), LFR (current), RGCF (Rate of Gross Capital Formation), and TFP (current) did not show statistically significant effects on SSG in the long run based on their p-values.

R-squared (0.9516) and Adjusted R-squared (0.8668): These values are high, indicating a good fit of the model to the data in terms of explaining the variation in SSG.

Durbin-Watson Statistic (2.1827): This value close to 2 suggests no significant autocorrelation in the residuals, which is a good sign for the model's reliability.

F-statistic (11.22924, p-value = 0.000912): This statistically significant F-statistic indicates that the model as a whole is statistically significant in explaining SSG.

EGYPT

Tables 4 and 5 present the results of the short-run and long-run estimations for Egypt.

Table 4: Long-Run Estimation For Egypt

Dependent Variable: SSG				
Method: ARDL				
Date: 05/11/24 Time: 14:45				
Sample (adjusted): 2001 2023				
Included observations: 23 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): DEI DCP SSE GE GFCF HDI				
LFR RGCF TFP				
Fixed regressors: C				
Number of models evaluated: 512				
Selected Model: ARDL(1, 0, 0, 1, 1, 0, 0, 0, 0, 0)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SSG(-1)	0.505871	0.309969	1.632008	0.1337
DEI	-0.486132	0.563735	-0.862342	0.4087
DCP	-0.068459	0.095521	-0.716690	0.4900
SSE	-0.186398	0.326829	-0.570322	0.5810
SSE(-1)	-0.378471	0.305131	-1.240356	0.2432
GE	-0.074333	0.068555	-1.084276	0.3037
GE(-1)	-0.111750	0.048125	-2.322072	0.0426
GFCF	-0.213827	0.331048	-0.645910	0.5329
HDI	78.78898	45.74203	1.722464	0.1157
LFR	3.666083	69.25863	0.052933	0.9588
RGCF	0.031363	0.045244	0.693192	0.5040
TFP	1.960843	28.23429	0.069449	0.9460
C	18.19302	73.15585	0.248688	0.8086
R-squared	0.944965	Mean dependent var		49.31395
Adjusted R-squared	0.878923	S.D. dependent var		3.477922
S.E. of regression	1.210184	Akaike info criterion		3.516947
Sum squared resid	14.64545	Schwarz criterion		4.158749
Log-likelihood	-27.44490	Hannan-Quinn criteria.		3.678359
F-statistic	14.30849	Durbin-Watson stat		2.341847
Prob(F-statistic)	0.000101			
*Note: p-values and any subsequent tests do not account for the model selection.				

Table 5: Short-Run Estimation for Egypt

Dependent Variable: D(SSG)				
Method: Least Squares				
Date: 07/27/24 Time: 23:56				
Sample (adjusted): 2002 2023				
Included observations: 22 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.043245	0.697265	0.062021	0.9521
D(SSG(-1))	0.181128	0.212998	0.850374	0.4198
D(DEI)	-0.374750	0.370521	-1.011414	0.3414
D(DEI(-1))	-0.660363	0.433674	-1.522717	0.1663
D(SSE)	-0.073841	0.268873	-0.274632	0.7906
D(SSE(-1))	-0.226300	0.244113	-0.927029	0.3810
D(DCP(-1))	0.011841	0.074326	0.159307	0.8774
D(GE(-1))	-0.117578	0.029030	-4.050273	0.0037
D(GFCF(-1))	-0.286110	0.301033	-0.950427	0.3697
D(HDI(-1))	93.49671	139.1655	0.671838	0.5206
D(LFR(-1))	-39.89160	47.20965	-0.844988	0.4227
D(RGCF(-1))	0.026886	0.029774	0.902998	0.3929
D(TFP(-1))	12.99814	22.54040	0.576660	0.5800
ECM(-1)	-1.453856	0.291359	-4.989911	0.0011
R-squared	0.890188	Mean dependent var		0.339553
Adjusted R-squared	0.711744	S.D. dependent var		1.685189
S.E. of regression	0.904769	Akaike info criterion		2.898852
Sum squared resid	6.548856	Schwarz criterion		3.593152
Log likelihood	-17.88737	Hannan-Quinn criter.		3.062408
F-statistic	4.988611	Durbin-Watson stat		1.605537
Prob(F-statistic)	0.014454			

Short-Run Estimation Result Interpretation and Discussion

DEI and Technological Innovations: The coefficients for both D(DEI) and D(DEI(-1)) are negative but not statistically significant, suggesting that changes in the digital economy, as a proxy for technological innovations, do not have a significant impact on short-run service sector growth in this model. This is contrary to the initial expectation.

The Government Expenditure in lag one has a significant but negative impact of -0.117578, p-value of 0.0037 on short-run Service Sector Growth. This suggests restrictive regulatory environments in Egypt.

Labour Force Ratio and Capital Formation: The coefficients for D(LFR(-1)) and D(RGCF(-1)) are not statistically significant, implying that changes in labour force ratio and rate of capital formation do not significantly affect short-run service sector growth.

ECM(-1): The negative and highly statistically significant coefficient for ECM(-1) (-1.4539) confirms the presence of a long-run relationship among the variables and indicates a relatively fast adjustment towards the long-run equilibrium

Long-Run Estimation Result Interpretation and Discussion

SSG(-1): The coefficient (0.5059) is positive but not statistically significant (p-value = 0.1337). This suggests a weak relationship between past SSG and current SSG. There might not be a strong error correction mechanism in the short run based on this finding.

GE(-1) lagged Government Expenditure: Government policies proxied to government expenditure in the previous time (-0.1118, p-value = 0.0426) have a statistically significant negative impact on service sector growth in the long run suggesting an unfriendly policy environment.

DEI, DCP, SSE, GE, GFCF, HDI, LFR, RGCF, and TFP do not have statistically significant effects on SSG in the long run based on their p-values.

R-squared (0.944965) and Adjusted R-squared (0.878923): These values are high, indicating a good fit

of the model to the data in terms of explaining the variation in SSG.

Durbin-Watson Statistic (2.341847): This value is close to 2, suggesting there's likely no significant autocorrelation in the residuals. This is a good sign for the reliability of the model's estimates.

KENYA

Table 6 presents the results of the ARLD analysis for Kenya.

Table 6: ARDL Analysis Output for Kenya

Dependent Variable: SSG				
Method: ARDL				
Date: 05/11/24 Time: 14:49				
Sample (adjusted): 2001 2023				
Included observations: 23 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): DEI DCP SSE GE GFCF HDI LFR RGCF TFP				
Fixed regressors: C				
Number of models evaluated: 512				
Selected Model: ARDL(1, 1, 1, 0, 1, 1, 1, 0, 0, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SSG(-1)	-0.835653	0.446165	-1.872966	0.1102
DEI	-0.063905	0.304177	-0.210092	0.8405
DEI(-1)	0.418970	0.241182	1.737155	0.1330
DCP	0.005284	0.242932	0.021750	0.9834
DCP(-1)	-0.191299	0.220865	-0.866132	0.4197
SSE	8.971752	2.652473	3.382411	0.0148
GE	-0.030650	0.062904	-0.487246	0.6434
GE(-1)	-0.092004	0.077195	-1.191845	0.2783
GFCF	-0.143534	0.335874	-0.427344	0.6840
GFCF(-1)	0.719549	0.310972	2.313868	0.0600
HDI	-428.1741	174.8013	-2.449490	0.0498
HDI(-1)	257.4639	91.60640	2.810545	0.0307
LFR	-746.6636	185.1036	-4.033760	0.0069
RGCF	0.011231	0.042507	0.264214	0.8005
TFP	33.76674	34.63957	0.974803	0.3673
TFP(-1)	-86.30430	31.00629	-2.783445	0.0319
C	138.7780	52.37342	2.649779	0.0380
R-squared	0.983020	Mean dependent var		53.09462
Adjusted R-squared	0.937739	S.D. dependent var		4.397418
S.E. of regression	1.097246	Akaike info criterion		3.158010
Sum squared resid	7.223696	Schwarz criterion		3.997289
Log-likelihood	-19.31712	Hannan-Quinn criteria.		3.369087
F-statistic	21.70962	Durbin-Watson stat		2.628580
Prob(F-statistic)	0.000537			
*Note: p-values and any subsequent tests do not account for the model selection.				

SSE: Current Service Sector Employment (SSE) has a positive and statistically significant coefficient (8.971752, p-value = 0.0148). This suggests a strong positive relationship between current service sector employment and current service sector growth. In other words, an increase in employment within the service sector leads to an increase in service sector growth in the same period.

GFCF(-1): Lagged Gross Fixed Capital Formation

(GFCF) has a positive and marginally significant coefficient (0.719549, p-value = 0.0600). This suggests that an increase in investment in the previous period might lead to an increase in service sector growth in the current period.

HDI: Human Capital (HDI) and its lag (HDI(-1)) both have significant effects on the current SSG in Kenya.

DEI, DCP, GE, GFCF, RGCF, and TFP do not show statistically significant effects on SSG in the long run based on their p-values.

R-squared (0.983020) and Adjusted R-squared (0.937739): These values are very high, indicating a very good fit of the model to the data in terms of explaining the variation in SSG.

NIGERIA

Tables 7 and 8 present the results of the Short-run and Long-run Estimations for Nigeria.

Table 8: Long-Run Estimation For Nigeria

Dependent Variable: SSG				
Method: ARDL				
Date: 05/11/24 Time: 14:52				
Sample (adjusted): 2001 2023				
Included observations: 23 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): DEI DCP SSE GE GFCF HDI				
LFR RGCF TFP				
Fixed regressors: C				
Number of models evaluated: 512				
Selected Model: ARDL(1, 1, 0, 0, 1, 1, 0, 1, 1, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SSG(-1)	0.121614	0.170505	0.713254	0.5025
DEI	1.872016	0.816263	2.293398	0.0617
DEI(-1)	1.078254	0.687498	1.568374	0.1678
DCP	-0.159654	0.226817	-0.703886	0.5079
SSE	5.215999	1.089614	4.787015	0.0030
GE	0.233454	0.060173	3.879726	0.0082
GE(-1)	0.175869	0.061440	2.862471	0.0287
GFCF	-0.040080	0.061543	-0.651252	0.5390
GFCF(-1)	0.166354	0.095200	1.747412	0.1312
HDI	-477.3600	87.60619	-5.448930	0.0016
LFR	684.1497	295.8007	2.312873	0.0600
LFR(-1)	-2247.280	778.2294	-2.887683	0.0278
RGCF	-0.465639	0.279728	-1.664615	0.1470
RGCF(-1)	-1.670197	0.397135	-4.205615	0.0057
TFP	-151.6823	26.49800	-5.724293	0.0012
TFP(-1)	139.5578	23.18878	6.018334	0.0009
C	553.7046	233.3573	2.372776	0.0553
R-squared	0.982286	Mean dependent var		49.14111
Adjusted R-squared	0.935047	S.D. dependent var		5.366858
S.E. of regression	1.367786	Akaike info criterion		3.598790
Sum squared resid	11.22504	Schwarz criterion		4.438069
Log-likelihood	-24.38609	Hannan-Quinn criteria.		3.809867
F-statistic	20.79430	Durbin-Watson stat		2.617236
Prob(F-statistic)	0.000608			
*Note: p-values and any subsequent tests do not account for the model selection.				

Short-Run Estimation Result Interpretation and Discussion

Digital Economy (DEI): The coefficients for both D(DEI) and D(DEI(-1)) are not statistically significant, suggesting that changes in the digital economy, as a proxy for technological innovations, do not have a significant impact on short-run service sector growth in this model.

Service Sector Employment (SSE): The coefficients for both D(SSE) and D(SSE(-1)) are statistically significant, indicating that both current and lagged changes in service sector employment influence current service sector growth. The positive coefficient for D(SSE) suggests that an increase in current service sector employment is associated with an increase in service sector growth.

Labour Force Ratio (LFR): The positive and statistically significant coefficient for D(LFR(-1)) (836.3980) suggests that an increase in the previous period's labour force ratio is associated with an increase in the current period's service sector growth.

Total Factor Productivity (TFP): The positive and statistically significant coefficient for D(TFP(-1)) (86.5179) suggests that an increase in the previous period's total factor productivity is associated with an increase in the current period's service sector growth.

Error Correction Term (ECM): The negative and highly statistically significant coefficient for ECM(-1) (-1.6740; p-value 0.0000) confirms the presence of a long-run relationship among the variables and indicates a relatively fast adjustment towards the long-run equilibrium.

Long-Run Estimation Result Interpretation and Discussion

Lagged Service Sector Growth: The coefficient (0.121614) is positive but not statistically significant (p-value = 0.5025). This suggests a weak effect of past SSG on current SSG.

Service Sector Employment (SSE) has a positive and statistically significant coefficient (5.215999, p-value = 0.0030). This indicates that an increase in employment in the service sector leads to higher service sector growth in the same period.

GE: Government Expenditure (GE) and its lag (GE(-1)) both have positive and statistically significant coefficients (GE: 0.233454, p-value = 0.0082; GE(-1): 0.175869, p-value = 0.0287). This suggests that a positive government policy environment both current and lagged, leads to higher service sector growth in the short run in Nigeria.

DEI: Digital Economy (DEI) and its lag (DEI(-1)) show positive coefficients, but neither are statistically significant (DEI: 1.872016, p-value = 0.0617; DEI(-1): 1.078254, p-value = 0.1678). There is weak evidence to suggest a possible positive relationship between the digital economy and service sector growth in the long run.

LFR: Labour Force Ratio (LFR) has a positive coefficient (684.1497) but is not statistically significant (p-value = 0.0600). There is evidence of a positive long-run relationship between the labour force ratio and service sector growth in Nigeria.

GFCF(-1): Lagged Gross Fixed Capital Formation (GFCF) has a positive coefficient (0.166354) but is not statistically significant (p-value = 0.1312). The evidence for the long-run impact of lagged investment on service sector growth is weak.

RGCF: Rate of Gross Capital Formation (RGCF) and its lag (RGCF(-1)) both have negative coefficients (RGCF: -0.465639, RGCF(-1):: -1.670197) with RGCF(-1) being statistically significant (p-value = 0.0057). This suggests a possible negative long-run relationship between the rate of gross capital formation and service sector growth.

TFP: Total Factor Productivity (TFP) and its lag (TFP(-1)) have opposite signs in their coefficients (TFP: -151.6823, TFP(-1): 139.5578). TFP(-1) has a statistically significant positive coefficient (p-value = 0.0009), suggesting that an increase in lagged productivity leads to higher service sector growth in the long run.

R-squared (0.982286) and Adjusted R-squared (0.935047): These values are very high, indicating a very good fit of the model to the data in terms of explaining the variation in SSG.

SOUTH AFRICA

Tables 9 and 10 present the results of the short-run and long-run estimations for South Africa.

Table 9: Short-Run Estimation For South Africa

Dependent Variable: D(SSG)
Method: Least Squares
Date: 07/28/24 Time: 00:09
Sample (adjusted): 2002 2023
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.125081	0.148442	0.842625	0.4239
D(SSG(-1))	0.616379	0.170587	3.613278	0.0068
D(DEI)	-0.444516	0.294003	-1.511944	0.1690
D(DEI(-1))	-0.484976	0.255522	-1.897979	0.0943
D(SSE)	-0.141279	0.099662	-1.417578	0.1941
D(SSE(-1))	0.067828	0.156745	0.432728	0.6766
D(DCP(-1))	-0.055752	0.013060	-4.268959	0.0027
D(GE(-1))	0.228304	0.087999	2.594402	0.0319
D(GFCF(-1))	0.021738	0.161294	0.134772	0.8961
D(HDI(-1))	-12.15509	19.85448	-0.612209	0.5574
D(LFR(-1))	20.38023	18.96207	1.074790	0.3138
D(RGCF(-1))	0.002791	0.016407	0.170122	0.8691
D(TFP(-1))	-5.254594	4.985820	-1.053908	0.3227
ECM(-1)	-1.876483	0.321521	-5.836272	0.0004

R-squared	0.930296	Mean dependent var	0.175078
Adjusted R-squared	0.817027	S.D. dependent var	0.956742
S.E. of regression	0.409249	Akaike info criterion	1.312142
Sum squared resid	1.339879	Schwarz criterion	2.006441
Log likelihood	-0.433557	Hannan-Quinn criter.	1.475698
F-statistic	8.213171	Durbin-Watson stat	1.849278
Prob(F-statistic)	0.002829		

TABLE 10: LONG-RUN ESTIMATION FOR SOUTH AFRICA

Dependent Variable: SSG				
Method: ARDL				
Date: 05/11/24 Time: 14:55				
Sample (adjusted): 2001 2023				
Included observations: 23 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): DEI DCP SSE GE GFCF HDI				
LFR RGCF TFP				
Fixed regressors: C				
Number of models evaluated: 512				
Selected Model: ARDL(1, 0, 0, 1, 0, 1, 1, 1, 1, 0)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SSG(-1)	0.257188	0.265998	0.966878	0.3658
DEI	0.091629	0.506388	0.180946	0.8615
DCP	0.017303	0.024789	0.698033	0.5077
SSE	0.636266	0.323610	1.966152	0.0900
SSE(-1)	0.886194	0.333554	2.656823	0.0326
GE	-0.233387	0.198416	-1.176252	0.2779
GFCF	-0.417589	0.307521	-1.357919	0.2166
GFCF(-1)	-0.806757	0.462640	-1.743810	0.1247
HDI	-85.67872	52.02572	-1.646853	0.1436
HDI(-1)	-73.84691	34.13376	-2.163457	0.0673
LFR	76.77505	43.90294	1.748745	0.1238
LFR(-1)	54.84746	27.48905	1.995247	0.0862
RGCF	-0.097946	0.051218	-1.912345	0.0974
RGCF(-1)	-0.053136	0.040957	-1.297336	0.2356
TFP	2.429648	6.828632	0.355803	0.7325
C	51.39174	29.87208	1.720394	0.1290
R-squared	0.928334	Mean dependent var		63.35628
Adjusted R-squared	0.774764	S.D. dependent var		1.178413
S.E. of regression	0.559264	Akaike info criterion		1.877329
Sum squared resid	2.189430	Schwarz criterion		2.667238
Log-likelihood	-5.589279	Hannan-Quinn criteria.		2.075989
F-statistic	6.045015	Durbin-Watson stat		2.555717
Prob(F-statistic)	0.011353			
*Note: p-values and any subsequent tests do not account for the model selection.				

Short-Run Estimation Result Interpretation and Discussion

The lagged Service Sector Growth has a positive and significant impact on current Service Sector Growth, with a coefficient of 0.616379 and a p-value of 0.0068 in the short run. This indicates that there is a strong positive relationship between the service sector growth in the previous period and the current period's service sector growth.

The lagged Government Expenditure has a positive and significant impact on SSG, with a coefficient of 0.228304 and a p-value of 0.0319.

Error Correction Term (ECM): The negative and highly statistically significant coefficient for ECM(-1) (-1.8765) confirms the presence of a long-run relationship among the variables and indicates a relatively fast adjustment towards the long-run equilibrium.

Long-Run Estimation Result Interpretation and Discussion

SSG(-1): The coefficient (0.257188) is not statistically significant (p-value = 0.3658). There's no evidence of an error correction mechanism in the short run, meaning past service sector growth does not significantly affect current growth.

SSE: Employment in the Service Sector (SSE) has positive coefficients for both current and lagged values

(SSE: 0.636266, p-value = 0.0900; SSE(-1): 0.886194, p-value = 0.0326). This suggests that an increase in service sector employment, both current and lagged, leads to higher service sector growth in the short run.
DEI: Digital Economy (DEI) and its lags (DEI(-1)) do not show statistically significant effects on SSG (DEI: p-value = 0.8615). There is no evidence of a long-run relationship between the digital economy and service sector growth.
While DEI, DCP, LFR, and TFP have positive relationships with service sector growth in South Africa, HDI, GFCF and RGCF have negative relationships with it but they are all statistically not significant.
R-squared (0.928334) and Adjusted R-squared (0.774764): These values are high, indicating a good fit of the model to the data in terms of explaining the variation in SSG.

5.0 CONCLUSION

The findings reveal a complex relationship between these factors and service sector growth. In contrast, short-run dynamics suggest a positive association between service sector employment and growth across all countries. This suggests that the sector contributes more to national GDPs because of the number of employments it creates. It is likely to be creating more employment than other sectors hence, its leading contribution to the economy. The anticipated role of the digital economy (DEI) as a driver of growth was not statistically significant in any country. In some cases, human capital (HDI) exhibited a negative relationship with growth, highlighting a weak transmission mechanism between service sector growth and human capital in Africa. This suggests that human capital in Africa needs to improve and develop much more to the stage where it impacts sectoral growth and national productivity at large.
This study underscores the importance of a multifaceted approach to fostering service sector growth in African countries. While traditional factors like employment and government expenditure remain relevant, policymakers need to delve deeper to understand the specific ways in which human capital and technological innovations can contribute to a thriving service sector. Investing in service-oriented skills development, strategically aligning human capital development with service sector needs, and exploring the potential of specific digital technologies are crucial steps.

RECOMMENDATIONS

Based on the findings of this study, the policymakers in Africa have an urgent need to consider the following and make policies to explore the current expansion potential of the service sector of their various economies to bring about the attainment of long-desired development on the continent:
1. Fostering Employment Growth in the Service Sector: The positive and statistically significant association between service sector employment (SSE) and service sector growth (SSG) across all countries highlights the importance of policies that promote job creation within this sector. This could involve:
Skills Development Programs: Invest in programs that equip the workforce with the necessary skills to thrive in the digital economy and service-based jobs.
Entrepreneurship Support: Providing financial and technical assistance to entrepreneurs, particularly those focused on innovative service-based ventures.
Regulatory Reforms: Streamlining regulations and bureaucratic processes to facilitate the creation and operation of service-oriented businesses.
2. Strategic Government Expenditure, Programs, and Investments: The study suggests that government expenditure (GE) can have a positive short-run impact on service sector growth in some countries. However, effective targeting of such expenditure is crucial. Here are some considerations:
Infrastructure Development: Prioritizing investments in infrastructure projects that support the growth of the service sector, such as information and communication technology (ICT) infrastructure and transportation networks.
Education and Training: Increasing public spending on education and training programs that cater to the specific skills demanded by the evolving service sector.
Research and Development (R&D): Allocating resources towards R&D initiatives that foster innovation within the service sector.
3. Re-evaluating the Role of Human Capital:
The digital economy is knowledge-based and human capital-driven. Hence, the human capital of Africans must drive the African digital economy and the development of technological innovations to harness the potential of the digital economy for surplus productivity, sustained economic growth, and development. To reverse the negative relationship observed between human capital (HDI) and service sector growth in these countries and generally in Africa therefore, policy actions to address the following should be pursued urgently across the Continent:
Skill Mismatch: The poor performance of HDI suggests that the current education systems are not adequately preparing graduates for the specific skill sets required in the service sector. Hence, education policies to ensure that graduates acquire the skillsets

that the industries need particularly the service sector must be given topmost focus.

Brain Drain: The issue of skilled professionals leaving African countries for opportunities abroad, hampering the contributions of a section of this human capital to the service sector growth has to be halted by the creation of highly rewarding systems for these professionals and by regulations.

4. Exploring the Potential of the Digital Economy:

There was no evidence of a statistically significant long-run impact of the digital economy (DEI) on service sector growth in any of the countries, this is largely due to the limitations of poor digital infrastructure, low investment in R&D, poor digital skills as well as lack of thriving environment and significant incentives for technology start-up, such as high rewards for landmark digital technology inventions and African made innovations with highly motivating patent fee and royalty. The following are recommended:

Invest in digital infrastructure: Develop a robust and affordable digital infrastructure, including broadband internet access, to facilitate the adoption of digital technologies across all sectors.

Promote digital literacy and skills development: Equip the population with the necessary digital literacy skills to leverage the opportunities offered by the digital economy.

Establishment of a competitive and highly rewarding patent registration and royalty system: as it is obtainable in advanced nations such as the United States of America where there is a highly rewarding and competitive system for technological innovations and inventions, African governments should make considerable investments to attract the continents' talents who are escaping to other nations stay back and offer them high rewards for their inventions as well as national and continental honours.

REFERENCES

Adejumo, O. O., Adejumo, A.V., and Aladesanmi, T.A. (2020). Technology-driven growth and inclusive growth- implications for sustainable development in Africa https://doi.org/10.1016/j.techsoc.2020.101373

Aghion, P. & Peter.H. (1992.). A model of growth through creative destruction. Econometrica, 60 (2),323-351, http://www.jstor.org/stable/2951599 Antonelli, C., Crespi, F., Quatraro, F. (2020). Knowledge complexity and the mechanisms of knowledge generation and exploitation: The European Evidence. Research Policy, p. 104081.

Asongu, S. A., & Le Roux, S. (2017). Enhancing ICT for inclusive human development in Sub-Saharan Africa http://dx.doi.org/10.1016/j.techfore.2017.01.026

Christensen, C. (2013). The innovator's dilemma: when new technologies cause great firms to fail. Harvard Business Review Press.

Dietzmann, C., Heines, R., & Alt, R. (2020). The convergence of distributed ledger technology and artificial intelligence: an end-to-end reference lending process for financial services competence center ecosystems. In Proceedings: Twenty-Eighth European Conference on Information Systems (ECIS2020). Association for Information Systems. https://www.researchgate.net/publication/342039353

Dosi, G. (1984), Technical Change and Industrial Transformation, MacMillan: London and New York.

Dosi, G. (1996), "Opportunities, incentives and the collective patterns of technological change", forthcoming in the Economic Journal.

European Investment Bank. (2021). The rise of Africa's digital economy. https://www.eib.org/attachments/thematic/study_the_rise_of_africa_s_digital_economy_en.pdf

Feder, G. (1982). On export and economic growth. Journal of Development Economics, 2, 59–73.

Feder, R. E. B. (1982). On exports and economic growth. Journal of Development Economics, 12(1-2), 59-73.

Freeman, C. (1982), The Economics of Industrial Innovation, F.Pinter, London.

Freeman, C. (1987), Technology Policy and Economic Performance: Lessons From Japan, Pinter, London.

Freeman, C. (1994), "The Economics of Technical Change", Cambridge Journal of Economics, Vol. 18, pp. 463-514.

Grossman, G. M., & Helpman.E. 1991. Trade, knowledge spillovers, and growth. European Economic Review, 35 (2-3), 517-526. http://dx.doi.org/10.1016/0014-2921(91)90153-A

Grubler A (1990). The Rise and Fall of Infrastructures. Dynamics of Evolution and Technological

Change in Transport. Heidelberg, Germany, Physica-Verlag.

Intl Telecommunication Union (2017, 2018). The economic contribution of broadband, digitization and ICT regulation, ITU Publications. http://www.itu.org James, M., Eria, H., & Ibrahim, M. (2023). Analysis of the drivers of service sector growth in Uganda 10.1142/S2810943023500038

Kraus, M., Feuerriegel, S., & Oztekin, A. (2020). Deep learning in business analytics and operations research: Models, applications and managerial implications. European Journal of Operational Research, 281(3), 628–641. doi: 10.1016/j.ejor.2019.09.018 Njoh, A.J. (2018). The relationship between modern information and communications technologies (ICTs) and development in Africa. Util. Pol. 50, 83–90. https://doi.org/10.1016/j.jup.2017.10.005.

Lucas, R. E. (1988). On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3-42.

Qian, G. (2023). A study on the impact of the digital economy on rural development https://10.4108/eai.2-6-2023.2334654 Journal of Political Economy, 98 (5), S71 S102. The University of Chicago Press.

Solow, R. M. (1957). Technical Change and the Aggregate Production Function. The Review of Economics and Statistics, 39(3), 312-320.

Sunita, G., Megha, J., & Aishwarya, N. (2019). An empirical investigation on the associated linkage between human development and ICT: A South Asian perspective https://mpra.ub.uni-muenchen.de/96167

UNCTAD. (2015; 2017). The role of the services economy and trade in structural transformation and inclusive development United Nations TD/B/C. I/MEM.4/14 Distr. General 6 June 2017

Wang, J. (Ed.). (2023). Encyclopedia of Data Science and Machine Learning. IGI Global. https://doi.org/10.4018/978-1-7998-9220-5

WEF. (2018). The future jobs report. World Economic Forum Geneva Switzerland, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

World Bank. (2021). The Role of Digital Technologies in Service Sector Growth in Sub-Saharan Africa. World Bank Publications.

World Bank (2023). Harnessing the potential of the service sector for growth. https://documents1.worldbank.org/curated/en/099544403132351453/pdf/IDU0343e48530e212043860bee605aae66cfb04a.pdf

World Trade Organization. (2019). The future of services trade. https://www.wto.org/english/res_e/booksp_e/00_wtr19_e.pdf

Zhang, W., Zhao, S., Wan, X. & Yao, Y. (2021). Study on the effect of the digital economy on high-quality economic development in China https://doi.org/10.1371/journal.pone.0257365

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

IMPACT OF EMERGING TECHNOLOGICAL INNOVATIONS ON SUSTAINABLE DEVELOPMENT IN TEN SELECTED WEST AFRICAN COUNTRIES

[*1]Bolaji Titilope Ajileye & [2]Sarah Anyanwu
[1]Nile University of Nigeria
[2]University of Abuja
[*]Corresponding Author's Email: oladapobolaji2018@gmail.com; sarahanyanwu2003@yahoo.com

ABSTRACT
This study examines the simultaneous contribution of technological innovation to economic growth, human development, and environmental quality in West African countries. Considering data availability, this research was conducted in ten selected West African countries. The study employed the Generalized Method of Moment and Pairwise causality test on panel data from 2013 to 2022. The study revealed that at a 5% significance level, technological innovations negatively impact economic growth by 0.2%, positively improve human development by 0.1%, and enhance environmental sustainability by 0.23% in the short run. Notably, the study shows a bidirectional causality between technological innovation and environmental quality at a 1% level of significance, highlighting the complex relationship between these two factors. Also, at a 5% level of significance, there is unidirectional causality from human development to economic growth but no causality between economic growth and technological innovation. Based on these findings, this study recommends that West African governments and policymakers should encourage investment in research and development and give adequate incentives to sectors that contribute to immediate economic growth. Also, governments should ensure balanced technological progress that includes marginalized populations. In addition, government policies should promote the adoption of eco-friendly technologies, encourage a circular economy to create new economic opportunities and mitigate environmental degradation in the selected West African countries.

Keywords: *Economic growth, Environmental Quality, Human development, Technological innovations, and West Africa*

1.0 INTRODUCTION

Recent global discourse by governments, policymakers and economists on sustainable development has highlighted the importance of integrating economic growth, human development, and environmental sustainability (United Nations, 2015; Dhahri & Omri, 2018). This integration is particularly relevant to West African countries, where socio-economic challenges are linked with environmental degradation and limited technological advancement (UNDP, 2018).

West Africa has experienced significant economic growth over the past few decades. In 2022, the region's growth increased to 4.4%, driven by sectors such as agriculture, mining, and services (World Bank, 2019). However, the Covid-19 pandemic caused a slowdown, with the growth rate decreasing to 3.9% in 2022 and 3.2% in 2023. Projections indicate a recovery, with growth expected to rise to 4.0% in 2024 and 4.4% in 2025 (African Development Bank, 2024). Despite the positive trend, growth has not been uniformly inclusive or environmentally sustainable, as the region is still struggling with high poverty rates, inadequate infrastructure, and environmental challenges, including deforestation, water scarcity, and pollution (AfDB, 2020).

Technological innovation has gained global recognition as a critical driver of sustainable development. It offers potential solutions to many of the pressing challenges faced by most developing nations, precisely West Africa. Technological innovation, comprising advancements in information and communication technologies (ICT), renewable energy, agricultural technologies, and financial technologies, has a promising potential to address many of these complex challenges faced by West African countries. For instance, mobile technology has transformed inclusion and access to services in different parts of Africa (GSMA, 2019). Countries like Nigeria and Ghana have made significant paces in ICT adoption. They are becoming hubs for technology start-ups like the FinTech sector.

On the other hand, countries like Niger and Mali have lower levels of technology penetration and innovation due to deficit infrastructural and socio-political challenges. Furthermore, renewable energy technologies such as solar energy and smart cities also offer solutions for alleviating energy shortages and reducing reliance on fossil fuels (IRENA, 2020). Agriculture technologies such as drones, drip irrigation, tractors and harvesters, and solar-powered irrigation have increased productivity and enhanced food security in the West African agricultural sector.

Despite these potentials, the adoption and impact of technological innovations in West Africa are uneven and face several barriers. These barriers include limited access to capital, inadequate policy frameworks, and a shortage of skilled human resources (OECD, 2018). Sachs, Schmidt-Traub, Kroll, Lafortune, and Fuller (2019) opined that the relationship between technological innovation and sustainable development is intricate and context-dependent, thereby necessitating comprehensive analysis to understand its dynamics fully.

Several empirical studies Emma, Haibo and Isaac (2022); Sunanda (2022); Oyegoke and Aras (2021); Anis (2020); Dominic et al. (2020); Bekhet and Abdul Latif (2018); Iyoboyi and NaAllah, (2014) have demonstrated the significant and positive impact of technological innovation on economic growth, environmental sustainability, and human development in both developed and developing economies. Meanwhile, Ismaila (2022) confirmed that technological innovation has an adverse effect on economic growth in the ECOWAS region. These mixed findings suggest the need for a more comprehensive study that will consider simultaneously economic growth, human development, and environmental sustainability in the West African context.

This study fills the empirical gap by examining the role of technological innovation in promoting the sustainable development of ten selected West African countries. It provides a comprehensive understanding of how technological advancement simultaneously stimulates economic growth, improves environmental quality, and enhances human development in the West Africa region. The selected countries represent a cross-section of West Africa's diverse socio-economic landscapes. The selected West African countries include Benin, Burkina Faso, Cote d'Ivoire, Ghana, Guinea, Mali, Niger, Nigeria, Senegal and Togo. These West African countries rely heavily on the extractive and export of natural resources such as oil and Gas (Nigeria being the major oil producer, while Mali and Ghana have significant gold mining activities), Agriculture dominance, low ICT, penetration, limited research and development investment and weak institutional framework.

This study employed the panel data approach, and the study period is from 2013 to 2022, making it timely and relevant. The study addresses the potential endogeneity issues in the panel data approach using the Generalized Method of Moment. Additionally, the study used the Pairwise Granger causality test to examine the direction of causality among the variables. Furthermore, the study is in five sections. Section 1 presents the study's background, Section 2 reviews the relevant literature, Section 3 describes the data and methodology, Section 4 reports the empirical findings, and Section 5 concludes the study with recommendations.

2.0 LITERATURE REVIEW AND THEORETICAL REVIEW

The relationship between emerging technological innovation and sustainable development is a critical area of contemporary theoretical and empirical discourse. The current argument is outlined through several interconnected dimensions, including technological innovation as a catalyst for economic growth, enhancing human capital development and improving environmental sustainability.

Theoretical models, such as the Solow-Swan growth model and endogenous growth theories, emphasize the role of technology in enhancing productivity and driving economic expansion. Particularly, classical theory opines that there is a positive relationship between technological innovation and economic growth (Solow, 1956). Meanwhile, the endogenous growth theory developed by Romer (1990) and Lucas (1988) posited that technological innovation is a crucial driver of long-term economic growth. The traditional growth model views technological progress as an exogenous factor. In contrast, the endogenous growth model integrates it as a core element within the economic system.

Further, Schumpeter (1934) emphasized the role of entrepreneurial activities and innovation in economic development. According to him, technological advancement stimulates economic dynamism, creating new industries and transforming the existing ones. Aker and Mbiti (2010) highlighted the increase in digital technologies, such as mobile phones and the Internet, that enhance economic activities. Accordingly, these technologies reduce transaction costs, improve market efficiencies, and enable new forms of economic interaction. For instance, in West Africa, mobile banking and digital marketplaces have played a significant role in enhancing financial inclusion and economic participation (Asongu & Nwachukwu, 2018).

The second dimension is the relationship between human capital development and technological innovation. The human capital theory proposed by Becker (1964) stated that investment in education and skills training enhances an individual's productive capability, thus resulting in economic growth. As opined by Isaacs (2007), technological innovation has drastically transformed

educational methodologies. It makes learning more efficient and accessible. Therefore, E-learning platforms and digital literacy programs are critical in developing the human capital necessary for a technology-driven economy (Garkio, 2006). Rogers (1962) also introduced the diffusion of innovation theory to explain how, why and at what rate new ideas and technologies spread through cultures. For example, telemedicine and mobile health applications have improved access to medical services, enhanced disease surveillance and contributed to better health outcomes, thereby supporting human capital development (Olu, 2019; Mars & Scott, 2010). Lundvall and Johnson (1994) further stressed the importance of continuous learning and adaptation in economies characterized by rapid technological changes. Therefore, vocational training programs supported by technological tools are essential for equipping individuals with the skills required in the digital economy (Aterido et al., 2011). Consequently, these programs aid in maintaining a competitive workforce and drive economic development (World Bank, 2016).

Lastly, technological innovation leads to environmental improvements while promoting growth. Hajer (1995) and Mol and Spaargaren (2000) expressed that modern technologies can aid in decoupling economic growth from environmental degradation. Therefore, this theory highlights the potential of technologies such as renewable energy, sustainable agriculture practices, and smart grids to lead to more sustainable production and consumption patterns. UNDP (2012) further buttresses the point that renewable energy technologies such as solar and wind power are essential for reducing greenhouse gas emissions and combating climate change. Therefore, this transition in technologies supports long-run environmental sustainability and aligns with global climate goals (Sovacool & Drupady, 2012). Ndung'u and Signe (2020) stressed the need to integrate technology into urban planning to improve the living conditions of urban dwellers, reduce pollution and create sustainable cities. Consequently, smart city technologies such as smart grids, energy-efficient buildings and sustainable transport systems are essential for managing the rapid urbanization in West Africa (Agyemen, McLauren, & Schaefer-Borrengo, 2016).

Several empirical studies have examined the relationships between technological innovation and sustainable development. However, most of these studies examined the individual dimensions of sustainable development separately. Therefore, this study examines the role of technological innovation in stimulating economic growth, enhancing human development, and improving the environmental quality of West African countries.

A recent empirical study by Maha, Pingfeng and Guihua (2023) examined the causality between technological innovation and economic growth of 20 developing countries over the period from 1990 to 2018. The study employed the panel Generalized Method of Moment. Gross national product per capita was the dependent variable. The independent variables were education expenditures and patents by residents and non-residents, research and development expenditures, and researchers in research and development activities, high-tech exports, and scientific and technical journal articles. The study concludes that technological innovation has a positive impact on economic growth in the countries under study.

Zejiong and Hongmei (2022) assessed the impact of technological innovation on high-quality economic development in China. The study covered 30 provinces in China for the period from 2013 to 2019. They employed a fixed effect model and found out that the level of high-quality development in China is growing steadily but with gaps among the regions. In Nigeria, Oyegoke and Aras (2021) examined the impact of technological innovation on economic growth for the period from 1980 to 2018. The study employed the ARDL method of estimation. It concluded that innovation in the form of technological transfer and spillover has a positive impact on economic growth.

Similarly, using the dynamic ordinary least square model and panel data from 1970 to 2011, Iyoboyi and Na-Allah (2014) revealed that technological innovation has a positive impact on economic growth in Nigeria. Bekhet and Abdul Latif (2018) also empirically investigated the effects of institutional quality and technological innovation on achieving sustainable growth in Malaysia over the period from 1995 to 2015. The study concludes that governance interacts positively with technological innovation, thereby contributing to sustainable growth in the country.

The empirical study by Dominic, Ejemeyovwi, Adiat, and Ayanda (2020) investigated the role of innovation on human development in West Africa for the period from 2004 to 2014. The study employed the Generalized least square method, panel fixed effect and panel random effect estimation methods. The study revealed that research and development have a positive and significant impact on human development in West Africa, as well as Gyimah-Brempong, Paddison, and Miliku. (2006) performed a panel analysis of human development in

African countries, covering 40 years from 1960 to 2000. The study found that the impact of education on human development was significant and increased steadily over the decades. Emma, Haibo, and Isaac (2022) studied 25 African countries from 2000 to 2018. They used Augmented Mean group and common correlated effect mean group estimation techniques. The study revealed that green technological innovation and renewable energy consumption have a significant but negative impact on carbon emissions in Africa. Furthermore, an empirical study by Anis (2022) examined the relationship between technological innovation and sustainable development in 75 countries, including low, middle, and high-income countries. The study employed Dynamic ordinary least square and panel VECM to test for the short-run causality. The study found that, in the long run, technological innovation contributes to the three pillars of sustainable development.

3.0 DATA AND METHODOLOGY

This study examines the impact of technological innovation on sustainable development, including economic growth, environmental quality, and human development, in 10 selected West African countries. The study employed a panel data approach, and the data span was from 2013 to 2022 for each country. The list of selected countries, as well as the descriptions and sources of variables, are presented in Table 1. Due to the availability of data, this study empirically examines the contribution of technological innovation to sustainable development in Ten selected West African countries.

Table 1: List of selected West African countries, descriptions and sources of variables

NO	Countries	NO	Countries
1	Benin	6	Mali
2	Burkina Faso	7	Niger
3	Cote d'Ivoire	8	Nigeria
4	Ghana	9	Senegal
5	Guinea	10	Togo

Descriptions and sources of variables.

Acronyms	Variables	Descriptions	Sources
EG	Economic growth	GDP per capita (constant 2015 US$)	World Bank Indicators (WDI)
TI	Technological Innovation	Total number of patent applications (Residents plus non-residents)	World Intellectual Property Organization (WIPO)
HDI	Human Development	Human development index	United Nations Development Program (UNDP)
CO_2	Carbon emission	Carbon emissions (Metric tons per capita)	World Bank Indicators (WDI)

This study estimated the effect of technological innovation and sustainable development in West African countries. The study employed different Generalized Methods of Moment to provide an efficient parameter estimate by exploring the moment conditions while maintaining consistency. Based on the empirical work of Dhahri and Omri (2018) and Anis (2020), the simultaneous equation model for this study is as follows:

Technological Innovation

$$TI_{i,t} = (EG_{i,t}, CO_{2i,t}, HDI_{i,t}) \quad (1)$$

Economic growth

$$EG_{i,t} = (TI_{i,t}, CO_{2i,t}, HDI_{i,t}) \quad (2)$$

Human Development

$$HDI_{i,t} = (TI_{i,t}\, EG_{i,t}, CO_{2i,t},) \quad (3)$$

Environmental Quality

$$CO_{2_{i,t}} = (TI_{i,t}, EG_{i,t}, HDI_{i,t}) \quad (4)$$

These equations represent the interrelationships among technological innovation, economic growth, human development and environmental quality in West African countries. The natural log transformation of this model is as follows:

$$logTI_{i,t} = \beta_0 + \beta_1 \log(EG_{i,t}) + \beta_2 \log(CO_{2i,t},) + \beta_3 \log(HDI_{i,t}) + \mu_{i,t} \quad (5)$$

$$logEG_{i,t} = \beta_0 + \beta_1 \log(TI_{i,t}) + \beta_2 \log(CO_{2i,t},) + \beta_3 \log(HDI_{i,t}) + \mu_{i,t} \quad (6)$$

$$logHDI_{i,t} = \beta_0 + \beta_1 \log(TI_{i,t}) \ \beta_2 \log(EG_{i,t}) + \beta_3 \log(CO_{2i,t},) + \mu_{i,t} \quad (7)$$

$$logCO_{2,i,t} = \beta_0 + \beta_1 \log(TI_{i,t}) + \beta_2 \log(EG) + \beta_3 \log(HDI_{i,t}) + \mu_{i,t} \quad (8)$$

The general modelling method of GMM estimation method for panel data is as follows:

$$Y_{i,t} = X_{i,t}\beta + Z_i b_i + \varepsilon_i \quad (9)$$

Where $Y_{i,t}$ represents the dependent variable, $X_{i,t}$ is the matrix of explanatory variables that do not include a constant term. $Z_i b_i$ captures the impact of heterogeneity and involves both specific cross-sectional effects and time-specific effects. ε_i It is the error term that incorporates residuals from differences in both cross-section and time series. The subscript i represents cross-sectional units, and t represents data points in time series.

Before conducting the regression analysis, it is imperative to ascertain the stationarity of the variables employed in this study. The order of integration of the variables was determined by the first-generation panel unit root test, including Im, Peseran & Shin (IPS), Levin, Lin & Chu (LLC) t* ADF-Fisher and PP-Fisher panel unit root tests (Peseran, 2007). The result of the panel stationary test revealed that the variables are stationary at level 1(01) and first difference 1(1), respectively, so we examine the long-run effect using the Pedroni panel co-integration test (Pedroni 1999, 2004). The co-integration test indicates the absence of co-integration among the variables, indicating that there is no long-run implication among the variables. Therefore, to investigate the short-run impact of technological innovation on economic growth, environmental quality and human development, we employed the Generalised Method of Moment. Arellano and Bond (1991) developed this method of estimation, and it is one of the most used estimation models in economics and finance. It is a powerful tool for panel data analysis, especially when dealing with unobserved heterogeneity, dynamic models, and endogeneity. Furthermore, the Pairwise Granger causality test determines the direction of causality among the variables.

4.0 EMPIRICAL FINDINGS AND DISCUSSIONS

Stationarity testing is a crucial preliminary step in ensuring the validity of subsequent econometric modelling. Therefore, to determine the order of integration of the variables, the study employed the first-generation panel unit root, including Im, Peseran and Shin Levin. Lin & Chu t*, ADF-Fisher chi-square, and PP-Fisher chi-square.

Table 2: Panel Unit Root Test Results

	Level				
	LTI	**LEG**	**LHDI**	**LCO_2**	**Order**
LLC	0.48150	-2.16790**	-4.82437**	-3.03554**	1(0)
P&S	0.61191	0.93753	-0.38377	0.02068	
ADF	2.79109	16.1275	20.8498	22.0372	
PP	1.46550	12.2761	45.5442**	26.2894	1(0)
	First Difference				
LLC	1.51772	-8.80626**	-1.11305	-6.16359**	1(1)
P&S	-0.13745	-3.25891**	-0.16442	-1.72452**	1(1)
ADF	4.23498	50.7074**	22.5527	37.6778**	1(1)
PP	19.9239**	48.2213**	59.9483	79.8698**	1(1)

Source: E-Views 12 Output

Note: The probability values * and ** indicate the significance of 1% and 5% levels, respectively.

The result from Table 2 indicates that at a 5% significant level, the variables are stationary at level 1(0) and first difference 1(1), respectively. These outcomes indicate a consistent, predictive trend and reliability of the variables to examine the impact of technological innovation on sustainable development in the ten selected West African countries.

Table 3: Descriptive Statistics and Correlation Matrix

Variables	Mean	Median	Maximum	Minimum	Std dev.	Skewness	Kurtosis
LTI	1.278119	0.500316	6.113682	-2.302585	2.058239	0.792422	2.765555
LEG	7.109509	7.032172	8.071204	6.208663	0.517566	0.087213	1.748294
LHDI	-0.719791	-0.681219	-0.446287	-0.986177	0.124462	-0.44230	2.689102
LCO_2	-1.061535	-0.921197	-0.263217	-2.445884	0.598366	-0.819197	2.883744

Correction Matrix

	LTI	LEG	LCO_2	LHDI
LTI	1			
LEG	0.642756	1		
LCO_2	0.322159	0.798716	1	
LHDI	0.225394	0.706101	0.799662	1

Source: E-Views 12 Output

Table 3 presents the descriptive statistics and the correlation matrix based on annual data from the period between 2013 to 2022. The variables include GDP per capita (LEG), patent application (LTI), carbon emission (LCO_2) and Human Development Index (LHDI). The estimated mean of LEG, LTI, LCO_2 and LHDI is 7.11, 1.28, -1.06 and -0.72 respectively. Similarly, the maximum values are 8.07, 6.11, -0.26 and -0.45, respectively. The standard deviation displays a moderate deviation from the mean across the variables with the values LEG (0.52), LTI (2.058), LCO_2 (0.598), and LHDI (0.124). Also, LEG and LTI are positively skewed, demonstrating a right-skewed distribution, while LCO_2 and LHDI exhibits a left-skewed distribution. LTI, LCO_2 and LHDI has a relatively high kurtosis, indicating a peaked distribution; in contrast, LEG has lower kurtosis, indicating a flatter distribution.

The correlation matrix test examines the relationships among the variables employed in this study. The outcome shows that LTI correlates with itself, as expected. It also has a positive correlation with GDP per capita, carbon emissions, and the human development index. Although its relationship with carbon emissions and the human development index is relatively weak. Also, the correlation between technological innovation and GDP per capita is moderately high, signifying that technological innovation plays a critical role in enhancing economic growth in the West African region.

Table 4: Pedroni Panel Co-integration Test Results

With-Dimension	Statistic	Prob*
Panel v-Statistic	-0.586750	0.7213
Panel rho-Statistic	1.244215	0.8933
Panel PP-Statistic	1.253714	0.8950
Panel ADF-Statistic	0.406571	0.6578
Between -Dimension		
Group rho-Statistic	1.991877	0.9768
Group PP-Statistic	0.227240	0.5899
Group ADF-Statistic	-0.657014	0.2556

Source: E-Views 12 Output

The study employed the Pedroni co-integration test to determine the presence of long-run relationships since the variables integrate at different orders of integration. The result from the Pedroni panel co-integration test revealed no co-integration, suggesting that there is no long-run effect among the variables used. Therefore, the study examined the short-run impact of technological innovation on economic growth, human development, and environmental quality.

Table 5: Pairwise Granger Causality Results.

Null Hypothesis	F-Statistics	Prob
LTI does not Granger Cause LEG	0.62252	0.5428
LEG does not Granger Cause LTI	0.48500	0.6200
LHDI does not Granger Cause LEG	3.06798	0.0524
LEG does not Granger Cause LHDI	0.42216	0.6572
LCO_2 does not Granger Cause LEG	1.66248	0.1991
LEG does not Granger Cause LCO_2	1.13580	0.3286
LHDI does not Granger Cause LTI	0.35052	0.7069
LTI does not Granger Cause LHDI	0.70923	0.4994
LCO_2 does not Granger Cause LTI	4.10472	0.0269
LTI does not Granger Cause LCO_2	5.31561	0.0108
LCO_2 does not Granger Cause LHDI	0.25652	0.7747
LHDI does not Granger Cause LCO_2	2.61663	0.0821

Source: E-Views 12 Output

The Pairwise Granger causality test explores the causal relationships among the variables. The result from Table 5 shows that in the short run, there is unidirectional causality from human development to economic growth at a 5% level of significance. This finding indicates that improvement in human development Granger caused economic growth in West African countries. There is no causal relationship between technological innovation and economic growth, Human development and technological innovation. Similarly, there is no causal relationship between carbon emissions and economic growth. Conversely, there is a bidirectional relationship between technological innovation and carbon emission. This outcome revealed a feedback loop between environmental quality and technological innovation in the short run.

Table 6: Impact of Technological Innovation on Sustainable Development Results.

	Model 1	Model 2	Model 3	Model 4
LTI(-1)	0.3745** (0.0000)			
LTI		-0.0176** (0.0042)	0.0101 (0.0777)	-0.0229 (0.4521)
LEG(-1)		0.4151** (0.0000)		
LEG	-1.1541 (0.1162)		0.0705**(0.0013)	0.2456**(0.0314)
LHDI(-1)			-0.1215** (0.0120)	
LHDI	-0.2988 (0.6348)	0.0211 (0.7979)		-0.0631 (0.8384)
LCO_2 (-1)				0.0897 (0.0562)
LCO_2	-4.3584** (0.0036)	0.2984** (0.0012)	-0.0405 (0.4194)	
J-statistic	5.2379	8.8537	7.1741	6.9824
Prob(J-statistic)	0.5137	0.1819	0.4109	0.3225
Instrument rank	10	10	11	10
Wald Test	7785.3** (0.0000)	2613.8** (0.0000)	12.6915**(0.0000)	3.5340** (0.0177)
AR(1)	-1.2221 (0.2217)			
AR(2)		-0.4555 (0.6488)	-0.000112 (0.9999)	2.7820 (0.254)
Jarque-Bera	1.2939 (0.5236)	1.9108 (0.3846)	44.1930 (0.0000)	0.7995(0.7995)

Source: E-Views 12 Output

Taking technological innovation as the dependent variable in model one. The findings revealed that all things being equal, an increase in past levels of technological innovation would significantly influence the current level of innovation by 0.37 units. This result indicates a cumulative progress of technological innovation in West African countries. The result also shows that economic growth and human development have a negative but insignificant effect on technological innovation. Holding other variables constant, one unit increase in economic growth and human development will result in 1.15 units and 0.298 unit decrease in technological innovation. These findings suggest that higher growth in the West African countries might lead to a reduction in innovation due to a shift towards less innovation-intensive sectors and complacency in the countries. Besides, a one-unit increase in environmental degradation will significantly decrease technological innovation by 4.36 units. This negative impact suggests that higher environmental degradation has a detrimental effect on innovation.

This study used GDP per capita as the dependent variable in model two, and the outcome indicates that holding other variables constant, a one-unit increase in technological innovation will significantly decrease economic growth by 0.02 units. This negative impact suggests a trade-off between technological innovation and economic growth in the short run, as initial investment in innovation may divert resources away from immediate economic productivity in the short run. This finding confirms the recent prior study by Ismaila (2022), whose study revealed that the negative effect of technological innovation in the Ecowas countries was due to weak institutions and poor policy implementation by the government. However, it contradicts the findings by Iyoboyi and Allah (2014), Bujari and Martinez (2016) and Anis (2020), whose empirical studies have shown that technological innovation drives economic growth.

In addition, the result in Table 6 also indicates a significant and positive relationship between past and current economic growth with the value of a 0.42-unit increase. This positive outcome suggests that past economic performance influences the current economic condition in West African countries. Also, the result revealed that economic growth is increased by environmental degradation, and this could lead to long-run negative consequences for the economies. All things being equal, a one-unit increase in carbon emission will significantly increase economic growth by 0.298 units. The coefficient of the human development index indicates that a one-unit increase in the human development index will result in a 0.298-unit increase in economic growth. However, this impact is not statistically significant.

In model three, we take human development as the dependent variable. The result from Table 6 revealed that a one-unit increase in past human development significantly led to a decrease of 0.121 units in the current level. These findings suggest that a higher HDI in the past will likely decrease towards its long-run in the present period. Also, the study found that a one-unit increase in technological innovation will lead to a 0.010-unit increase in human development. However, this effect is only significant at 10%. This result indicates that technological innovation can contribute to improving human development outcomes in West African countries. Thus, an advancement in technology will improve society's life expectancy, education, health and well-

being. This finding is in line with the previous study by Anis (2020), Dominic, Ejemeyovwi, Adiat and Ayanda (2020). Likewise, the outcome reveals that a one-unit increase in economic growth will lead to a 0.070-unit increase in human development. This positive impact suggests that economic growth is associated with better access to education, health care and other essential services, which significantly contribute to improving human development in the countries. In addition, an increase in carbon emissions will decrease human development by 0.04 units. This outcome implies that environmental degradation has adverse effects on human health, education and the overall well-being of the citizens, which in turn results in a lower level of productivity.

Model four shows that taking carbon emissions as the dependent variable, one unit increase in past carbon emissions will increase its present level by 0.089 units. Thus, there is persistence in environmental degradation patterns in West African countries. From the result, a one-unit increase in technological innovation will insignificantly decrease carbon emissions by 0.023 units. Hence, in the long term, advancements in technology will lead to a more efficient and improved production process in West African countries. This outcome confirms the prior study by Kumar and Managi (2010), Omri and Kahouli (2014), and Anis (2020). Also, a one-unit increase in economic growth will significantly increase environmental degradation by 0.25 units. Thus, higher economic growth can be associated with increased industrialization and energy consumption, which results in environmental degradation in West African countries. In addition, a one-unit increase in human development will insignificantly decrease environmental degradation by 0.063 units. Therefore, a higher level of human development creates awareness of environmental issues and the adoption of cleaner technologies, leading to improved environmental quality.

Furthermore, the probability of the J-statistic of all the models shows that the instruments employed are jointly significant at 5%. In contrast, the Jaque-bera test shows that the residuals are normally distributed for model 1, model 2 and model 4, except for model 3. The Wald test result shows that the coefficients in all the models are jointly significant. Also, the Arellano bond serial correlation test reveals the absence of second-order serial correlation in models 2, 3 and 4. In contrast, model 1 results show the absence of first-order serial correlation.

5.0 CONCLUSION AND POLICY RECOMMENDATIONS

This study examines the impact of technological innovation on the sustainable development of ten selected West African countries. Using the Generalized Method of Moment and Pairwise Granger Causality test on panel data spanning the period from 2013 to 2022, this study examines the impact and direction of causality between technological innovations and sustainable development in West Africa. The findings of this study revealed that technological innovations have a significant but negative effect on economic growth. Hence, in the short run, technological innovation can disrupt the productivity level of existing industries through job displacement and income inequality, resulting in slow growth. Also, the findings demonstrate that technological innovation is statistically significant and positively improves human development in West Africa. Accordingly, technological advancement improves education, healthcare and the overall well-being of society. In addition, technological innovation enhances environmental quality, although its impact is insignificant in the short run. Thus, innovation in renewable energy, efficient waste management and sustainable agriculture will aid in influencing a greener future of the West African countries. Furthermore, the study indicates a bidirectional causality between technological innovation and environmental quality, a unidirectional causality from human development to economic growth, and no causality between technological innovation and economic growth, technological innovation and human development. Therefore, to mitigate the adverse effects of technological innovation on economic growth in the West African economies, the government should implement policies that encourage investment in research and development and give incentives to sectors that contribute to immediate economic growth. Likewise, governments and policymakers should ensure balanced technological progress that includes marginalized populations to promote human development in West African countries. In addition, government policies should promote the adoption of eco-friendly technologies and also encourage a circular economy to create new economic opportunities and mitigate environmental degradation in West African nations.

REFERENCES

African Development Bank (2024). African Economic Outlook 2024 Driving Africa's Transformation The Reform of the Global Financial Architecture.

African Development Bank (2020). African Economic Outlook 2020.

Agyeman, J., McLaren, D., & Schaefer-Borrego, A. (2016). Sharing Cities: A case for truly smart and sustainable cities. MIT Press.

Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives,* 24(3), 207–232.

Anis Omri (2020). Technological innovation and sustainable development: Does the stage of development matter? *Journal of Environmental Impact Assessment Review* 83.

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies,* 58(2), 277-297.

Asongu, S. A., & Nwachukwu, J. C. (2018). Mobile phone penetration, mobile banking and inclusive development in Africa. *Information Technology & People*, 31(1), 144-169.

Aterido, R., Hallward-Driemeier, M., & Pagés, C. (2011). Big constraints to small firms' growth? Business environment and employment growth across firms. *Economic Development and Cultural Change*, 59(3), 609-647.

Becker, G. S. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. University of Chicago Press.

Bekhet, H.A., Abdul Latif, N.W.A., 2018. The impact of technological innovation and governance institution quality on Malaysia's sustainable growth: evidence from a dynamic relationship. *Technol. Soc.* 54, 27– 40.

Dominic, E. Azuh, Jeremiah, O. Ejemeyovwi, Quneen Adiat & Babatunde A. Ayanda (2020). Innovation and Human Development perceptive in West Africa. *Sage*, 1–10.

Dhahri, S., Omri, A., 2018. Entrepreneurship contribution to the three pillars of sustainable development: What does the evidence really say? *World Dev.* 106, 64–77.

Emma, S. O.,Haibo Chen, & Isaac Adjei Mensah (2022). The impact of green technological innovation and institutional quality on Co2 emissions in African countries. *Journal of technological forecasting and social change*, 180, 121670.

Gakio, K. (2006). African Tertiary Institutions Connectivity Survey (ATICS) 2006 Report. *International Development Research Centre (IDRC).*

GSMA. (2019). The Mobile Economy Sub-Saharan Africa 2019.

Gyimah-Brempong, K., Paddison, O., & Mitiku, W. (2006). Higher education and economic growth in Africa. *Journal of Development Studies*, 42(3), 509–529.

Hajer, M. A. (1995). The politics of environmental discourse: Ecological modernization and the policy process. Oxford University Press.

International Renewable Energy Agency (IRENA). (2020). Renewable Energy Market Analysis: Africa and Its Regions.

Isaacs, S. (2007). ICT in education in ten Sub-Saharan African countries. World Bank.

Ismaila Y. Jammeh (2022). The effect of technological innovation on economic growth: evidence from ECOWAS countries. *International Journal of Social Sciences Perspectives,* 11, 1-10

Iyobiyo, M., & Na-Allah, A. R. (2014). Innovation and economic growth: evidence from Nigeria. *Euro Economica*, 33(1), 1-12.

Mars, M., & Scott, R. E. (2010). Global e-health policy: A work in progress. *Health Affairs*, 29(2), 237-243.

Lundvall, B.-Å., & Johnson, B. (1994). The Learning Economy. *Journal of Industry Studies*, 1(2), 23-42.

Mohamed, M.M.A.; Liu, P.; Nie, G.(2022). Causality between Technological Innovation and Economic Growth: Evidence from the Economies of Developing Countries. *Sustainability 2022*, 14, 3586.

Mol, A. P. J., & Spaargaren, G. (2000). Ecological modernization theory in debate: *A review. Environmental Politics,* 9(1), 17–49.

Ndung'u, N., & Signé, L. (2020). The Fourth Industrial Revolution and digitization will transform Africa into a global powerhouse. Brookings Institution.

Olu, O. (2019). The role of telehealth and telemedicine in health systems strengthening in Sub-Saharan Africa. *Global Health Action*, 12(1), 1572702.

Organization for Economic Co-operation and Development (OECD). (2018). OECD Investment Policy Reviews: Burkina Faso 2018.

Oyegoke, Ebunoluwa and Osman Nuri Aras (2021), Nexus between technological innovation and economic growth; Evidence from Nigeria

(1980-2018*), Nile Journal of Business and Economics* 18, 3-14.

Pedroni, P., (1999). Critical values for co-integration tests in heterogeneous panels with multiple regressors. Oxford. Bull. *Econ. Stat*. 61, 653–670.Pedroni, P., 2001. Purchasing power parity tests in cointegrated panels. *Rev. Econ. Stat*. 83, 727–731.

Pedroni, P., (2004). Panel co-integration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Economic Theory* 20, 597–625.

Pesaran, M.H., (2007). A simple panel unit root test in the presence of cross-section dependence. J. Appl. Econ. 22, 265–312.

Rogers, E. M. (1962). Diffusion of Innovations. Free Press.

Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy*, 98(5), S71-S102.

Sachs, J. D., Schmidt-Traub, G., Kroll, C., Lafortune, G., & Fuller, G. (2019). Sustainable Development Report 2019. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN).

United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development.

Schumpeter, J. A. (1934). The Theory of Economic Development. Harvard University Press.

Sunanda Easwaran (2022). Technology and Socio-Economic Development in India. *Journal of Entrepreneurship and Innovation in Emerging Economies*, 8(1) 9-28.

Sovacool, B. K., & Drupady, I. M. (2012). Energy access, poverty, and development: The governance of small-scale renewable energy in developing Asia. Ashgate Publishing, Ltd.

UNDP. (2012). Achieving Sustainable Energy for All in the Asia-Pacific. United Nations Development Programme.

United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development.

United Nations Development Programme (UNDP). (2018). Human Development Indices and Indicators: 2018 Statistical Update.

United Nations Development Programme (2024).

World Bank. (2019). Africa's Pulse, No. 19, April 2019: An Analysis of Issues Shaping Africa's Economic Future.

World Bank Indicators (2023).

Zhejiang Zhou and Hongmei Chen (2022). The impact of technological innovation on High-quality economic development based on Chinese provincial Data. *Frontiers in business economics and management*, 3, 1.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ISLAMIC ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT: LEVERAGING DIGITAL INNOVATION FOR HALAL BUSINESS GROWTH

Shukurat Moronke Bello
Department of Business Administration and Entrepreneurship, Bayero University Kano, Nigeria
smbello.bus@buk.edu.ng

ABSTRACT
Islamic entrepreneurship is considered as a solution to the complex and dynamic business environment. This paper aims to understand the impact of digital technology on sustainable halal businesses and Islamic entrepreneurship. The study employs a qualitative approach, specifically the content analysis of existing literature sourced from Google Scholar. This approach aids in developing a thorough comprehension of the research variables. The review looks into the potentials for Islamic entrepreneurship utilizing digital technologies offered by the Fourth Industrial Revolution (4IR). The foundational principles of Islamic entrepreneurship, emphasizes ethical conduct, social responsibility, and adherence to Shariah-compliant practices. It explores the integration of cutting-edge digital technologies such as blockchain, artificial intelligence, and the internet of things (IoT) into halal businesses. There are potentials for Islamic entrepreneurship to contribute to the United Nations' Sustainable Development Goals (SDGs) and promotes a holistic approach to economic development that aligns with Islamic values and principles. We argue that Islamic entrepreneurship, guided by principles of social responsibility and ethical conduct, can drive sustainable development and economic prosperity. Digital innovation, particularly in the areas of e-commerce, fintech, and digital marketing, offers significant opportunities for halal businesses to scale. By leveraging digital innovations, halal businesses can enhance market accessibility, operational efficiency, and consumer trust, thereby contributing to broader socio-economic advancement.

Keywords: *Digital Innovation, Ethical Conduct, Halal Business, Islamic Entrepreneurship, Sustainable Development*

1.0 INTRODUCTION

Entrepreneurship has been a the backbone of many industrialized countries, contributing to the exponential economic development, income, employment, technological development, innovation, social stability and equal distribution of wealth (Pasqualino et al., 2021). Islam views entrepreneurship as a type of economic activity with moral and ethical roots (Fikadu et al., 2023). Islamic entrepreneurship is more dynamic and holistic as compared to traditional entrepreneurship. Traditional entrepreneurship has primarily focused on monetary benefits (Kirby et al., 2023), whereas Islamic entrepreneurship addresses the prosperity of economies and social activities (Alamsyah et al., 2022). Islamic entrepreneurship seeks to give the public a sense of security and comfort so that the goods or services are utilized or consumed in accordance with Islamic values. Islam always encourages Muslim entrepreneurs to get involved in business activities and to do business as per Islamic law and principles (Raza et al., 2023).

The global Halal market, which represents the Islamic economy as a whole, is one of the fastest-growing markets in the world. The main contributors to this global Halal sector are entrepreneurs who run halal businesses. Many academics, researchers, business experts, and industry members have contributed to the definition of entrepreneurship globally. Islamic economic academics recently invented the term "Halal entrepreneurship" or "Halalpreneurship" to describe and separate business owners in the Halal market from those in other industries. People who conduct their business activities in accordance with Islam principles (*Maqasid al-Shari'ah)* have been referred to as Islamic entrepreneurs. (Fikadu et al., 2023). The halal industry has experienced significant growth, driven by increasing demand from Muslim consumers globally. This sector encompasses a wide range of products and services, including food, finance, cosmetics, and pharmaceuticals, adhering to Islamic principles. Halal markets are expanding beyond predominantly Muslim countries into non-Muslim-majority regions. This globalization requires halal businesses to adapt to diverse market conditions and consumer preferences.

Digital innovation refers to the use of digital technologies to create new or improved products, services, processes, or business models that significantly enhance value for businesses and their customers. It involves the integration of digital tools and methods to drive improvements, solve problems, and capitalize on new opportunities. As observed by Salaheldeen (2022), the ability of Islamic entrepreneurs to develop the underlying digital technology remains the most important determinant for the amount of real benefits realized through opportunities presented by the digital economy. Therefore, this study aim to examine the role

of digital innovation in enhancing the growth of halal businesses by Islamic entrepreneurs and Its contribution to sustainable development.

2.0 LITERATURE REVIEW

ISLAMIC ENTREPRENEURSHIP

Islam is a complete code of life. Islam as a religion promotes the concept of entrepreneurship. Entrepreneurship is an opportunity seeking business activity that is utilized by individuals, governments and society around the world to encourage economic development (Ramadani et al., 2015). Islamic entrepreneurship is based on values and principles compliant with Islamic Shariah (Khalique et al., 2020; Ramadani, 2021). Moreover, Muslim entrepreneurs are fortified to encompass only ethical and socially accepted businesses. Gümüsay (2020) discussed the role of religion in conducting business and highlighted its contribution to the development of business. Islam inspires men and women to perform lawful business activities that are compliant with shariah (Khalique et al., 2020). Islamic entrepreneurship is characterized by a commitment to ethical business practices, social justice, and community welfare, all in accordance with Sharia (Islamic law). This includes ensuring that business activities are halal (permissible) and avoiding haram (forbidden) practices. Islamic entrepreneurs often emphasize innovative approaches to business, driven by a combination of religious values and market opportunities. This spirit of innovation is crucial for adapting to a rapidly changing global market.

The basic framework of entrepreneurship based on Islam is taqwa (faith) and worship of Allah SWT. Within this framework, other elements complement Islamic entrepreneurship, including the concept of halal, namely the idea of efficiency, noble values, honesty, welfare, knowledge, and concern for the community and the environment (El Junusi & Mubarok, 2020). According to Khalique et al. (2020), Islamic entrepreneurship attitude is based on two main components namely business perspective and spiritual perspective. The teachings of Islam stress that any business transaction should be transparent and clear. Entrepreneurs must be trustworthy, honest and truthful. In Islamic entrepreneurship, spirituality has a high place and Islam emphasized that business transactions should be performed as per the guidelines of Islam.

2.2 Digital Innovation

Digital can be referred to any technology that connects people, machines and information (Salaheldeen, 2022). Digital innovation is the use of digital technology to create new or improved processes, products, or business models. It involves integrating digital technologies into various aspects of a business or society to drive growth, enhance efficiency, and improve user experiences.

2.2.1 Roles of Digital Innovation

Technological Advancement: Digital innovation often involves the adoption or creation of advanced technologies such as artificial intelligence (AI), machine learning, blockchain, the Internet of Things (IoT), and big data analytics. These technologies enable businesses to develop new capabilities and efficiencies.

New Business Models: Digital innovation can lead to the development of novel business models that leverage digital technologies to disrupt traditional industries. Examples include subscription-based services, platform-based business models, and digital marketplaces.

Enhanced User Experience: Digital innovation focuses on improving user experiences through intuitive interfaces, personalized interactions, and seamless integrations. Technologies like augmented reality (AR) and virtual reality (VR) can create immersive experiences that engage users in novel ways.

Process Optimization: Digital tools are used to optimize business processes by automating repetitive tasks, improving data management, and enhancing operational efficiency. Automation, cloud computing, and advanced analytics are key components in this aspect.

Data-Driven Decision Making: The ability to gather, analyze, and leverage data is a central component of digital innovation. Businesses use data analytics to make informed decisions, predict trends, and tailor their strategies to meet customer needs.

2.2.2 Scope of Digital Innovation

Technologies and Tools

Artificial Intelligence (AI) Data Analytics

AI algorithms can analyze large datasets, identify patterns, and make predictions. Applications include natural language processing, image recognition, and autonomous systems. AI algorithm are getting more “humane attributes” that make people become more glued to and dependent on their smartphones (Za’aba et al., 2020). The emergence of Fintech is somewhat awaited by digital natives to “replace” their dependence on other people in gaining information and conducting financial transaction independently (Arnaut & Bećirović, 2023).

Internet of Things (IoT)

IoT connects physical devices to the internet, enabling them to collect and exchange data. This technology is used in smart homes, industrial automation, and health monitoring. Besides, IoT is everyday objects embedded with internet-connected devices, for instance wireless

internet connection and sensors, that allow them to send and receive data (Madakam, 2022).

Automation and Robotics

Automation has been present throughout the history of work. Technological development greatly influences the processes and operations of enterprises. For example, machines are used in lieu of manual work in unsafe or routine tasks. But there remains an important question of which tasks are replaceable by technology and which still require social and creative intelligence and human decision-making (Tavas, 2020). Nonetheless, no industry is safe from the potential disruption of automation and artificial intelligence. Their impact on healthcare, manufacturing, logistics, finance, and retailing will undoubtedly be significant (Dwivedi et al., 2021).

Creating new business seems an intuitively viable option in the Islamic digital economy, considering the prevalence of automation in place of human labor. Startups

primarily take advantage of digital platforms and only employ a small number of individuals. Halal entrepreneurs could create their businesses based on automation as it is still rare in the Islamic economy.

Cloud Computing

Cloud computing provides scalable and on-demand access to computing resources and services over the internet. It enables businesses to store and process data, run applications, and collaborate remotely. Higher internet speeds that drastically reduce latency between internet user and remote data centers and falling costs of data storage have supported the viability of cloud computing (Katal, 2023). Cloud computing has transformed business models as it reduces the need for IT expertise, which is mainly cost centers for most companies. Additionally, it offers flexibility for scaling and allows consistent rollout and maintenance of applications (Sturgeon,2021). These advantages enable Halal entrepreneurs to use capital, manage costs, and scale according to the worldwide growth of user demands reliably and responsibly. In addition, through cloud-based interfaces, firms are now routinely exposing their business processes and functions to the outside world.

Extended Reality - Augmented Reality (AR) and Virtual Reality (VR)

AR and VR technologies create immersive digital experiences. AR overlays digital information onto the real world, while VR creates fully simulated environments. Virtual reality (VR) or augmented reality (AR) is an ecosystem of technologies that facilitates interaction and veritable engagement between customers and clients in a seemingly real or physical way (Wedel et al., 2020). Mixed reality (MR), on the other hand, is the integration of digital content and physical reality, such that users can use real objects to interact in the digital world or simultaneously interact with digital and real-world objects. The combination of all three technologies is a significant quantum leap called extended reality (XR), which revolutionizes spatial computing. XR can potentially overcome the physical, spatial, and time constraints in tourism, especially as the depth and length of the negative impact of the pandemic on the tourism industry remains unknown.

XR will open the doors for innovators in Islamic digital economy. Virtual objects can effectively replace physical objects: the famous Monalisa can be hanged on one's virtual wall, while the physical one realistically cannot be purchased. Virtual objects require less storage space, thus one's living space can become smaller. XR also reduces the necessity to commute or travel for both work (e.g., conferences) and leisure purposes (e.g., concerts and sports events).

Blockchain:

Blockchain technology provides a decentralized and secure way to record transactions and manage digital assets. It is used for applications such as digital currencies, supply chain tracking, and smart contracts. Blockchain are a form of distributed ledger technology that facilitates direct secure transactions between two or more parties and permanently records those transactions (Niranjanamurthy et al., 2019). Popularly known for its use to support cryptocurrencies, blockchain has many use cases in other domains of importance to developing countries (Alqudah et al., 2023).

Therefore, Islamic entrepreneurship is tasked with the creation of Sharia-compliant standards to operationalize Islamic values and ethics. Also, entrepreneurs must develop new strategies to respond to current economic changes, especially those brought by the digital revolution.

B. Applications and Impact Areas

Customer Experience: Digital innovation enhances customer interactions through personalized experiences, efficient service delivery, and interactive platforms. Technologies such as chatbots, recommendation engines, and mobile apps play a significant role.

Operational Efficiency: Businesses use digital tools to streamline operations, reduce costs, and improve productivity. Automation, supply chain management systems, and process optimization are key areas of impact.

Product and Service Development: Digital innovation enables the creation of new products and services or the

enhancement of existing ones. For example, digital platforms facilitate the development of new financial products or innovative health solutions.

Market Reach and Distribution: Digital channels and platforms expand market reach and enable businesses to reach global audiences. E-commerce, digital marketing, and social media are essential for market expansion and customer engagement.

Collaboration and Communication: Digital technologies improve collaboration and communication within and between organizations. Tools like video conferencing, project management software, and collaborative platforms enhance team coordination and efficiency.

Security and Privacy: Digital innovation includes advancements in cybersecurity to protect data and systems from threats. Encryption, biometric authentication, and threat detection systems are critical for safeguarding information.

2.3 Halal Business

The concept of halal refers to something that is allowed or permitted in Islam. A halal business refers to any commercial activity, operation, or product that adheres to the principles and guidelines set forth by Islamic law (Shari'ah). The term "halal" means "permissible" or "lawful" in Arabic. In the context of business, halal encompasses a wide range of activities and practices that are considered ethically and morally acceptable according to Islamic teachings. The key principles of Halal Business are: (i) Compliance with Shari'ah Law: Halal businesses must operate in accordance with Sharia, which governs various aspects of business practices, including transactions, product offerings, and ethical conduct. This compliance ensures that all aspects of the business adhere to Islamic legal and ethical standards (ii) Prohibition of Haram (Forbidden) Activities: Halal businesses must avoid activities and products that are deemed haram (forbidden) under Islamic law. This includes activities such as dealing with alcohol, pork products, and gambling. Businesses must ensure that their operations do not involve or promote these prohibited elements (iii) Ethical Conduct and Fair Trade: Halal businesses are expected to conduct their operations with integrity, fairness, and transparency. This includes honest dealings, fair pricing, and respect for the rights and dignity of employees, customers, and suppliers. (iv) Avoidance of Interest (Riba): Islamic finance principles prohibit the practice of riba, or interest, which is considered exploitative. Halal businesses must avoid interest-bearing transactions and seek alternative financing methods that comply with Sharia principles, such as profit-sharing arrangements or Islamic bonds. (v) Respect for Contracts and Agreements: Honoring contracts and agreements is a fundamental principle in Islamic business ethics. Halal businesses must fulfill their contractual obligations and ensure that their dealings are based on mutual consent and clear terms. (vi) Focus on Social Responsibility: Halal businesses are encouraged to contribute positively to society and support social welfare. This includes engaging in charitable activities, supporting community development, and ensuring that their business practices align with broader social and ethical goals.

2.4 Sustainable Development

Sustainable development is an approach to growth and progress that seeks to balance economic, social, and environmental considerations to ensure that current needs are met without compromising the ability of future generations to meet their own needs. The concept is often associated with the United Nations' Sustainable Development Goals (SDGs), which provide a framework for addressing global challenges.

2.4.1 Environmental Sustainability

- Resource Management: Efficient use of natural resources and minimizing waste to preserve ecosystems and biodiversity.
- Renewable Energy: Transitioning from fossil fuels to renewable sources like solar, wind, and hydroelectric power to reduce greenhouse gas emissions.
- Climate Action: Implementing strategies to mitigate and adapt to climate change, including reducing carbon footprints and enhancing resilience to extreme weather events.

4.2.2 Economic Sustainability

- Inclusive Growth: Ensuring economic development benefits all segments of society, reducing inequality and providing opportunities for all.
- Circular Economy: Adopting practices that emphasize recycling, reusing, and reducing waste to create closed-loop systems that minimize resource extraction.
- Sustainable Business Practices: Encouraging companies to operate responsibly, considering the long-term impacts of their activities on the environment and society.

4.2.3 Social Sustainability

- Equity and Social Inclusion: Promoting fair treatment and opportunities for all individuals, regardless of their background, gender, or socioeconomic status.
- Health and Well-being: Ensuring access to healthcare, clean water, and sanitation, and addressing issues like malnutrition and disease.
- Education and Empowerment: Providing access to quality education and resources to empower individuals and communities.

4.2.4 Governance and Policy

- Integrated Approaches: Creating policies that align economic, environmental, and social goals, and promoting collaboration across sectors and stakeholders.
- Transparency and Accountability: Ensuring that organizations and governments are transparent in their actions and accountable for their impacts on sustainability.

4.2.5 Sustainable Development Goals (SDGs)

The UN's 17 SDGs, established in 2015, offer a comprehensive blueprint for addressing global challenges. They cover areas such as poverty reduction, quality education, clean water and sanitation, affordable and clean energy, decent work and economic growth, and responsible consumption and production.

2.5 Digital Technology and Halal Business

The adoption of digital technologies such as e-commerce platforms, artificial intelligence, blockchain, and big data analytics is revolutionizing the halal industry. These technologies enable businesses to operate more efficiently, reach global markets, and offer new, innovative products and services. Digital platforms facilitate access to international markets, allowing halal businesses to reach a broader customer base. E-commerce sites and mobile applications enable businesses to offer their products and services globally, overcoming geographical barriers. Blockchain technology provides a transparent and immutable ledger of transactions, which is crucial for ensuring the authenticity and traceability of halal products. This technology helps in maintaining consumer trust by verifying that products meet halal standards.

AI-powered tools can analyze consumer behavior and preferences, allowing businesses to personalize marketing efforts, optimize supply chains, and enhance customer experiences. This personalization can lead to higher customer satisfaction and loyalty. The Islamic digital economy will require employees with new and different skillsets, novel social protection policies, and a new work-leisure relationship amidst the blurring boundary between both. Halal entrepreneurs are presented with significant opportunities in the AI era, given its nascent adoption in the Islamic digital economy. Industries should explore the impact of AI in different contexts.

According to Jannah & Al-Banna (2021), two aspects of digital innovation are important to entrepreneurs, namely halal awareness and halal traceability. For entrepreneurs, halal awareness relates to the awareness of employing a halal process when making products. Entrepreneurs need to ensure the coordination and anticipation of various parties in the product supply chain in order to prioritise 'halal' as an important attribute. Halal traceability is the ability to trace a product from the production process to its distribution. It involves many parties, including suppliers, producers, logistics and end-users, all of whom help to ensure that the production process remains focused on halal attributes (Ab Rashid & Bojei, 2020).

2.6 Digital Technology and Sustainable Growth

2.6.1 Economic Sustainability

Digital technologies contribute to economic sustainability by driving growth, creating jobs, and increasing profitability. They enable halal businesses to scale operations and enhance their competitive edge in the global market.

2.6.2 Social Sustainability

Islamic entrepreneurship often emphasizes social responsibility and ethical practices. Digital technologies can support these goals by improving transparency, promoting fair trade, and ensuring that business practices align with Islamic values.

2.6.3 Environmental Sustainability

Technology can help halal businesses adopt environmentally friendly practices, such as reducing waste through efficient supply chain management and implementing green technologies. Digital tools also facilitate the monitoring and reporting of environmental impacts.

2.7 Theoretical Foundations

This paper's framework is rooted in Islamic entrepreneurship theory. The roots of the theory of Islamic behavior can be found in the study of Ashraf (2019), who extended

the theory of planned behavior and modified it with the help of the theory of boundedly rational planned behavior and the social entrepreneurial intentions theory (Mair & Noboa, 2006). Based on the mentioned theories, Ashraf (2021) proposed an Islamic entrepreneurship theory that retained similar antecedents of boundedly rational intentions for Islamic activities. Traditional entrepreneurship views humans as economic men who look after their own interests only. On the other hand, Islamic entrepreneurship considers spiritual aspects as well, and for that reason, the study has considered good intentions, respecting religious obligations, taqwa, trustworthiness, truthfulness and honesty to validate as well (Raza et al., 2023).

3.0 METHODOLOGY

The methodology involves a comprehensive literature review and content analysis to evaluate the role of digital innovation in enhancing the growth of halal businesses by Islamic entrepreneurs and Its contribution to sustainable development. This study employs a desk review and content analysis. The study sources literature from Google Scholar, a widely used academic database

that provides access to a vast array of scholarly articles, books, and conference papers (Gusenbauer, 2019). This platform is selected for its comprehensive coverage and the quality of academic sources it indexes. Literature is chosen based on relevance to the research topic, credibility of the sources, and the recency of the publications. This ensures that the analysis reflects current understanding and developments in the field. The selected literature is reviewed to familiarize researchers with the content. This includes reading abstracts, introductions, and conclusions to identify key themes and findings.The reviewed literature is categorized based on relevant themes, such as digital innovation, halal business growth, sustainable development, and Islamic entrepreneurship.

4.0 DISCUSSION

4.1 Impact of Digital Technology on Sustainable Halal Businesses Growth

4.1.1 Enhanced Operational Efficiency and Transparency

Digital technologies, such as automation tools and enterprise resource planning (ERP) systems, streamline various business processes. For halal businesses, automation can enhance efficiency in inventory management, production processes, and supply chain operations. This not only reduces operational costs but also ensures that halal compliance is maintained through consistent processes.

Similarly, blockchain technology offers a transparent and immutable record of transactions. For halal businesses, this means enhanced traceability of products from source to consumer. Blockchain can help verify the authenticity of halal claims, ensuring that products meet Islamic standards and increasing consumer trust. This transparency is crucial for maintaining the integrity of halal certifications and preventing fraud.

4.1.2 Market Reach and Consumer Engagement

Digital platforms such as e-commerce websites and mobile apps enable halal businesses to reach a global audience. By leveraging online sales channels, businesses can tap into international markets, catering to both Muslim and non-Muslim consumers interested in ethical and high-quality products. This expansion is particularly important in regions where physical halal stores are limited.

Advanced digital marketing techniques, including social media advertising and data analytics, allow halal businesses to engage with consumers more effectively. Personalized marketing strategies based on consumer behavior and preferences can enhance customer experience, drive sales, and foster brand loyalty. This engagement also helps businesses understand market trends and adapt their offerings accordingly.

4.1.3 Innovation and Product Development

Digital technology fosters innovation in product development by enabling businesses to use data-driven insights to create new and improved products. For halal businesses, this means the ability to develop products that meet evolving consumer preferences while adhering to halal principles. Innovations such as plant-based alternatives and new halal-certified formulations can attract a broader consumer base. Technology facilitates R&D efforts by providing access to advanced tools and resources. Halal businesses can use digital simulations, virtual prototypes, and other technologies to develop and test new products more efficiently. This capability supports sustainable practices by allowing businesses to optimize resource use and reduce waste during the development phase.

4.1.4 Sustainable Practices and Environmental Impact

Digital tools help businesses manage resources more effectively, contributing to sustainability goals. For instance, energy management systems and smart logistics can optimize resource use and reduce environmental impact. Halal businesses can implement these technologies to minimize their carbon footprint and align with sustainability principles. Technologies such as predictive analytics and supply chain management systems can reduce waste by improving demand forecasting and inventory management. By minimizing excess production and overstocking, halal businesses can reduce waste and contribute to environmental sustainability.

4.2 Implications of Digital Innovation for Islamic Entrepreneurship

4.2.1 Aligning Digital Innovation with Islamic Values

Islamic entrepreneurs must ensure that digital innovations align with ethical and moral standards set by Sharia. This includes avoiding technologies that promote unethical practices or violate Islamic principles. For example, Islamic entrepreneurs should carefully assess the implications of data privacy and AI algorithms to ensure they do not conflict with Islamic values. As digital technologies are integrated into halal businesses, maintaining the integrity of halal practices is paramount. Islamic entrepreneurs must implement robust systems for monitoring and verifying compliance with halal standards, leveraging technology to uphold transparency and authenticity.

4.2.2 Opportunities for Growth and Leadership

Embracing digital technology provides Islamic entrepreneurs with a strategic advantage in a competitive market. By adopting innovative solutions, businesses can enhance their operational efficiency, expand their market reach, and differentiate themselves from competitors. This advantage positions Islamic entrepreneurs as leaders in the evolving halal industry. Digital technology lowers entry barriers for emerging Islamic entrepreneurs by providing access to affordable tools and resources. This democratization of technology enables new players to enter the halal market, fostering entrepreneurship and innovation within the Islamic business community.

4.2.3 Challenges and Risk Management

Islamic entrepreneurs must address challenges related to digital security and privacy. Ensuring that data protection measures comply with both Islamic ethical standards and legal requirements is crucial for maintaining consumer trust and safeguarding business operations. The adoption of new technologies may pose challenges, including the need for technical expertise and investment. Islamic entrepreneurs should seek out training and support to effectively implement digital solutions while managing costs and mitigating risks.

As digital technology becomes integral to business operations, Islamic entrepreneurs must prioritize cybersecurity and data privacy. Ensuring the protection of sensitive information and complying with data protection regulations are essential for maintaining consumer trust and safeguarding business integrity. Technology Adoption and Training: The adoption of new digital technologies may require significant investment and technical expertise. Islamic entrepreneurs need to invest in training and skill development to effectively integrate these technologies into their operations and maximize their benefits.

4.2.4 Policy and Support Mechanisms

Policymakers should develop regulatory frameworks that support the integration of digital technology in halal businesses. These frameworks should address issues related to halal certification, data privacy, and ethical standards, providing guidance and support for Islamic entrepreneurs. Governments and industry organizations can offer support programs to assist Islamic entrepreneurs in adopting digital technologies. Initiatives such as grants, training programs, and technology partnerships can help businesses leverage digital tools and achieve sustainable growth.

Policymakers should develop frameworks that support the integration of digital technologies in halal businesses. This includes providing guidelines for halal certification in the digital realm, addressing ethical considerations, and fostering an environment that encourages innovation. Governments and industry organizations can offer incentives and support programs to help Islamic entrepreneurs adopt digital technologies. Grants, subsidies, and training programs can facilitate the integration of innovative solutions and promote sustainable business practices.

4.2.5 Aligning Digital Innovation with Islamic Values

As Islamic entrepreneurs embrace digital technologies, they must ensure that these innovations are compatible with Islamic ethical standards. This involves scrutinizing digital tools and platforms to ensure they align with Sharia principles, such as fairness, transparency, and integrity. For instance, AI algorithms must be designed to avoid biases that could conflict with Islamic teachings. Maintaining Halal Compliance:** Digital innovations must support the core principles of halal business operations. Islamic entrepreneurs need to implement robust digital systems to verify and maintain halal compliance, ensuring that all business activities, from product sourcing to consumer transactions, adhere to Islamic guidelines.

4.2.6 Strategic Opportunities and Competitive Advantages

Digital technologies open up new markets for Islamic entrepreneurs, allowing them to reach a global audience with minimal geographic limitations. By leveraging e-commerce platforms and digital marketing, entrepreneurs can expand their reach and attract a diverse customer base interested in ethical and high-quality products. Embracing digital tools provides Islamic entrepreneurs with opportunities to lead in innovation within the halal industry. By adopting cutting-edge technologies, they can develop new products and services that cater to evolving consumer needs, setting themselves apart from competitors.

4.2.7 Facilitating Sustainable Business Practices

Digital innovations enable Islamic entrepreneurs to streamline their operations, improve resource management, and enhance overall efficiency. Technologies such as automation and big data analytics help in reducing waste and optimizing supply chains, aligning with the principles of sustainability and responsible resource use. Islamic entrepreneurs can use digital tools to support environmental sustainability and social responsibility. For example, blockchain technology can enhance transparency in supply chains, ensuring ethical sourcing and reducing environmental impact. Digital platforms also facilitate corporate social

responsibility initiatives, such as community support and charitable activities.

5.0 CONCLUSION

This paper concluded that digital innovation encompasses a range of technologies, including e-commerce platforms, artificial intelligence, and blockchain, which can transform business operations and market reach. For halal businesses, these innovations offer opportunities to enhance efficiency, streamline operations, and expand into new markets while maintaining adherence to Islamic principles. Islamic entrepreneurs can leverage digital innovation to enhance their business operations while remaining true to halal principles. Embracing technologies like AI for predictive analytics, blockchain for supply chain transparency, and e-commerce for global reach can help halal businesses achieve substantial growth. These innovations also provide tools for maintaining halal compliance and ethical standards in an increasingly digital marketplace.
As digital technologies continue to evolve, Islamic entrepreneurs should stay abreast of emerging trends such as artificial intelligence, blockchain, and the Internet of Things. Understanding and leveraging these technologies will be crucial for maintaining a competitive edge and driving future growth. Digital innovation will continue to shape consumer expectations and behaviors. Islamic entrepreneurs must adapt to these changes by embracing digital tools that enhance customer experiences, personalize interactions, and meet the growing demand for ethical and transparent business practices.

To support the integration of digital innovation in halal businesses, policymakers should consider developing frameworks that encourage technological adoption while ensuring adherence to halal standards. Policies that promote digital literacy and provide incentives for technological investments could facilitate this integration. Additionally, establishing regulatory guidelines to address ethical concerns and ensure transparency in digital transactions is crucial. Future studies could empirically test the conceptual model to validate its applicability across different contexts and industries. Additionally, research could explore specific digital tools and their impact on various aspects of halal business operations and sustainable practices. Understanding the challenges faced by halal businesses in implementing these technologies and identifying best practices could provide valuable guidance for both entrepreneurs and policymakers.

REFERENCES

Ab Rashid, N., & Bojei, J. (2020). The relationship between halal traceability system adoption and environmental factors on halal food supply chain integrity in Malaysia. *Journal of Islamic Marketing*, *11*(1), 117-142.

Alamsyah, I. F., Omar, A., & Sarif, S. M. (2022). Towards conceptualising Islamic community-based enterprise: Examination of some underlying principles. *Islamic Research*, *5*(1), 1-17.

Alqudah, M., Ferruz, L., Martín, E., Qudah, H., & Hamdan, F. (2023). The sustainability of investing in cryptocurrencies: A bibliometric analysis of research trends. *International Journal of Financial Studies*, *11*(3), 93.

Arnaut, D., & Bećirović, D. (2023). FinTech innovations as disruptors of the traditional financial industry. In *Digital Transformation of the Financial Industry: Approaches and Applications* (pp. 233-254). Cham: Springer International Publishing.

Ashraf, M. A. (2019). Islamic marketing and consumer behavior toward halal food purchase in Bangladesh: An analysis using SEM. *Journal of Islamic Marketing*, *10*(3), 893-910.

Ashraf, M. A. (2021). Determinants of Islamic entrepreneurial intentions: An analysis using SEM. *Journal of Islamic Marketing*, *12*(1), 20-40.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. *International Journal of Information Management*, *57*, 101994.

El Junusi, R., & Mubarok, F. K. (2020). Islamic Entrepreneur resilience model: Retail business survives during crisis. *Journal of Digital Marketing and Halal Industry*, *2*(2), 89-106.

Fikadu, G., Kebede, K., & Kant, S. (2023). Entrepreneurship orientation to nurture the halal food industry future in Ethiopia. *Journal of Islamic Economic and Business Research*, *3*(1), 43-56.

Gümüsay, A. A. (2020). The potential for plurality and prevalence of the religious institutional logic. *Business and Society*, *59*(5), 855-880.

Gusenbauer, M. (2019). Google Scholar to overshadow them all? Comparing the sizes of 12 academic search engines and bibliographic databases. *Scientometrics*, *118*(1), 177-214.

Jannah, S. M., & Al-Banna, H. (2021). Halal awareness and halal traceability: Muslim consumers' and entrepreneurs' perspectives. *Journal of Islamic Monetary Economics and Finance*, *7*(2), 285-316.

Katal, A., Dahiya, S., & Choudhury, T. (2023). Energy efficiency in cloud computing data centers: A survey on software technologies. *Cluster Computing*, *26*(3), 1845-1875.

Khalique, M., Ramayah, T., Hina, K., & Shaari, J. A. N. (2020). Islamic entrepreneurship: A systematic review of future challenges and prospects of Pakistani SMEs. *International Journal of Economics, Management and Accounting*, *28*(2), 277-295.

Kirby, C., King, K., & Shipway, R. (2023). Embeddedness through sustainable entrepreneurship in events. *Event Management*, *27*(8), 1135-1150.

Madakam, S. (2022). An exploratory study on Internet of Things (IoT) in Indian smart cities: Lavasa, Palava, GIFT, Smartcity Kochi (SCK). *Palava, GIFT, Smartcity Kochi (SCK).*

Niranjanamurthy, M., Nithya, B. N., & Jagannatha, S. J. C. C. (2019). Analysis of Blockchain technology: Pros, cons, and SWOT. *Cluster Computing*, *22*, 14743-14757.

Pasqualino, R., Demartini, M., & Bagheri, F. (2021). Digital transformation and sustainable oriented innovation: A system transition model for socio-economic scenario analysis. *Sustainability*, *13*(21), 11564.

Ramadani, V. (2021). Islamic entrepreneurship. In *World Encyclopedia of Entrepreneurship* (pp. 457-470). Edward Elgar Publishing.

Ramadani, V., Dana, L. P., Ratten, V., & Tahiri, S. (2015). The context of Islamic entrepreneurship and business: Concept, principles, and perspectives. *International Journal of Business and Globalisation*, *15*(3), 244-261.

Raza, M., Khalique, M., Khalid, R., Kasuma, J., Ali, W., & Selem, K. M. (2023). Achieving SMEs' excellence: Scale development of Islamic entrepreneurship from business and spiritual perspectives. *Journal of Islamic Accounting and Business Research.*

Salaheldeen, M. (2022). Opportunities for halal entrepreneurs in the Islamic digital economy: Future and trends from a cultural entrepreneurship perspective. In *Cultural Entrepreneurship: New Societal Trends* (pp. 95-107). Singapore: Springer Nature Singapore.

Sturgeon, T. J. (2021). Upgrading strategies for the digital economy. *Global Strategy Journal*, *11*(1), 34-57.

Tavas, B. (2020). Artificial intelligence and robotics and their impact on business systems. *Journal of Social, Humanities*

and Administrative Sciences, 6(31), 1535-1546.

Wedel, M., Bigné, E., & Zhang, J. (2020). Virtual and augmented reality: Advancing research in consumer marketing. *International Journal of Research in Marketing, 37*(3), 443-465.

Za'aba, N. S., Zanorrain, S. M., Isa, N. A. M., & Raziman, N. (2020). Islamic digital economy: The role of Islamic Fintech as an economy driver. *Journal of Islamic Economics and Law (JIEL, 1*(2).

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

IMPACT OF NIGERIA EXTERNAL ECONOMIC INTERACTIONS ON ECONOMIC SUSTAINABILITY:A VECTOR AUTOREGRESSIVE APPROACH

Iortyer Aondover Dominic[1*] and Esseyin Funke Josphine[1]
[1]Department of Economics Federal University Lokoja
Corresponding Author's Email: iortyerdominic@gmail.com; funkep2@gmail.com

ABSTRACT
Countries of the world interact either bilateral or multilateral in different forms to achieve economic benefits. Thus the paper investigated the impact of economic external interactions and economic sustainability of Nigeria. The specific objectives of the study were to examinethe variance decomposition of one variable on another, and to investigate the impulse response function (shocks) of one variable on another. The investigation span from 1980 - 2023, time series data for the variables captured were sourced from CBN bulletins and National Bureau of Statistics (NBS). A vector autoregressive (VAR), model was specified and estimated. The real gross domestic product (RGDP) was a proxy for economic sustainability and the dependent variable. Export (EXP), imports (IMP), exchange rate (EXCH), and external debt (EXTD) were proxies for external economic interaction, and the independent variables. The impulse response function and the variance decomposition were estimated to examine the effects of shocks of one variable on another in both short run and long run. Findings revealed that, the greatest shocks are own shocks in the short run both more shocks from other variables in the long run. On the basis of the findings the study recommend for increase in exports and external debt reducing policies by channelling external debt to real sectors of the economy.

Keywords: *Economic sustainability, External interaction, External debt, Exports, Imports*

1.0 INTRODUCTION
The desire towards international interactions among countries both developed anddeveloping has generated intellectual discourse about its benefits in terms of economic and economic rationale. The advocates of open economy through trading and other forms of countries interaction observed that an open market policy will lead to a permanent direct annual increase in Gross Domestic Product (GDP), in addition to the indirect benefits that accrue in the form of reduced regressive tax burden and positive dynamic externalities (Mankiw, Romer and Weil, 1992).

Historically, export trade in raw agriculture products in Nigeria dates back to the 16th century. This resulted to bilateral trade between Nigeria and Western World with Nigeria having comparative advantage over agricultural produce in exchange for finished goods and this broadened the Nigeria's foreign earnings through the export of palm oil, cocoa, palm kernel,this constituted the mainstay of Nigerian economy contributing about 54.7 per cent to GDP (National Bureau of statistics, 2017).

However, the detection of oil changed the composition and structure of export trade in Nigeria with a radical shift from agriculture, as our major export to oil exportation. The Nigerian economy expanded rapidly, as oil production and export rose phenomenally. Duringand some few years after SAP, the main manufactured exports were textiles, beer and stout, cocoa butter, plastic products, processed timber, tyres, bottled water, soap and detergents as well as iron rods. However, some of these products have disappeared from the export list owing to poor enabling environment (Export Import Bank, 2019).

More so, the growth of imports during this period is attributed to several factors. These include the need to pursue economic development, the expansion in crude oil export that considerably raised foreign earnings and the over-valuation of the local currency, which artificially cheapened imports in preference to local production (Ajayi, 2021). The astronomical expansion of domestic absorption is a key factor that should not be ignored. As a result part of the growth in domestic absorption had to be satisfied by imports.

Overall, the Nigerian economy is import dependent with very little non-oil exports. It relies heavily on crude oil and gas exports with other sectors trailing far behind. For example,in the recent time crude oil accounts for about 90 per cent of foreign exchange earned by the country while non-oil exports account for the balance. The economy is, therefore, susceptible to external shocks, which by extension occasioned the internal and external debt accumulation to finance deficit. From the foregoing the study examines the impact of international economic interaction on Nigeria economic sustainability..

2.0 LITERATURE REVIEW
2.2.1 Theoretical review
The paper reviewed relevant theories that captured international interactions. These include: the classical theory and neo-classical theory, also known as the

modern theory. These theories according to their proponents maintained that international trade as a form of international interaction plays important role in promoting economic growth of the nations. The theories take cognisance that export trade is important for generating foreign exchanges that are needed for importation of goods that cannot be domestically produced. The theories are anchored on the principle of comparative advantage; that support the value of specialization, division of labour and free trade. For those theories, the advantage of external trade is fully maximized when it is entirely free from natural and man-made barriers. Both theories emphasise the gains from external trade.

2.2.2 The Comparative Advantage Theory

Ricardo (1817), in his famed theory of comparative advantage, demonstrate that countries benefit by specializing in the production of those goods with the lowest opportunity cost and trading the surplus of production over domestic demand, taking as given appropriate exchange-rate regimes. Under this model, a country will quickly specialise in sectors in which it has a comparative advantage. The classical theory is easily couched in terms of comparative cost specifically; the theory states that a country will tend to export the commodity whose comparative cost is higher in pre-trade isolation. Given the assumption of constant cost, a country will specialise completely in the production of commodity in whichit has comparative advantage.

2.2.3 The neo-classical (modern) theory

This theory is an attempt of modifying some unsatisfactory aspects of the classical theory. The neoclassical theory therefore, advanced a more satisfactory explanation for the existence of comparative cost differences between countries: introduced capital as a second factor of production and allowed for international differences in the pattern of demand. The introduction of a second factor of production proves very important. This makes approach of the classical theory and its main variant that is, Heckscher-Ohlin theory, to be successive in the handling of the relationship between factor allocation, income distribution and international trade.

2.2.4 The Heckscher-Ohlin theory

Ohlin postulates that trade arises from differences in comparative cost that in turn arise from inter-country differences in relative factor endowments (or relative factor abundance) are the most important single causes of international differences in price structures. According to thetheory, a nation should produce and export a product for which the large amount of the relative abundance resources is used. Such country should import the commodity in which a great deal of its relative scarce and expensive factors is used.

Intuitively, from these theories, international economic interactions of any sort increase total world output as all countries benefits from those interactions, which enables countries to secure capital and consumption of goods from other parts of the world. In this way, trade stimulates growth or serves as engine of growth.

Trade has been known to be a major contributor to the growth and development of economies. Domestic, national or international studies by economic historians have shown that in the progressive development of human society, from subsistence levels to modern economic system, the scale and level of trading is of crucial importance. Thus, while trade among the different regions or one country has its advantages and benefits, these are much smaller in scale than the potential gains derivable from participating in international trade.

Therefore, in assessing the nexus of Nigeria economic interactions for sustainable economic growth, many factors must be put in perspective taken . These include economic, social and political factors. In addressing the problems of international trade among less developed countries, it is necessary to examine the structure of the economy itself. This, in turn, is rooted in colonial economic policy, which served as the foundation for the prevailing structure of external trade in these countries.

2.3 Empirical Review

Literatures that aligned with the issue under discourse; the impact of external economic interactions on economic growth of developing countries with particular reference to Nigeria. Only a few studies have examined holistically the impact of various forms of interaction that impacts on Nigeria general economic growth. Early researchers in this area of study,(Darrat ,2002) conducted a study in the countries of Asia using time series data from 1960-2000 The study showed that there is a significant statistical association between export and economic growth. Similarly,(Kruger and Ito,2004) analysed the economic growth of East Asian countries from 1965-2003, and found that export enabled the countries' economy to grow at an annual average between 4-8%. In the same vein, Langley (2008), Onitiri (2011) and Ojo (2015) examined the effects of external trade on Nigeria's economic growth and the basic conclusion from these studies was that exports have been instrumental to the growth process. Since most of these studies used bivariate statistical and single equation regression techniques, they were naturally subject to the criticism of not allowing for feedback.

In taking care of this, Omoke and Ugwuanyi (2020)

investigate the relationship between export, domestic demand and economic growth in Nigeria using Granger causality and cointegration tests. The study results from Trace and Maximum Eigen Value test conducted showed that the variables do not have long-run relationship, but the Pair-wise Granger Causality test showed that economic growth Granger causes both export and domestic demand, while a bilateral causality exists between export and domestic demand. In a related study by Mohamed, Liew and Mzee (2016) on Tanzania using Vector Autoregressive (VAR) technique to analyse annual data from 1980 to 2014 to determine the long-run relationship between exports trade and economic growth. Their results also find no evidence for long-run relationship between export of goods and growth but suggest existence of a long-run nexus between export of services and economic growth in Tanzania.

In their own study on international trade and its effects on economic growth in China, Sun and Heshmati (2021) applied both econometric and nonparametric approaches based ona 6-year balanced panel data of 31 provinces of China from 2002 to 2020. The study demonstrates that increasing participation in the global trade helps China reap the static and dynamic benefits, stimulating rapid national economic growth.

As in the case of Safdari (2021), they examined the long-run relationship between foreign trade and economic growth in Iran between 1975 and 2019 using a VAR method of analysis. The results from their study showed that total population, trade volume, gross capital formation and tariffs have positive effect on economic growth.

Similarly, Adesuyi and Odeloye (2019) investigate foreign trade and economic growth in Nigeria between 1980 and 2010 using the Ordinary Least Square method to analyse the data. The result shows that Non-oil export value, Non-oil import value and Oil export value are positively related to GDP for the period under the study.

Arodoye and Iyoha (2019) examined foreign trade-economic growth nexus with evidence from Nigeria using VAR model to analyze quarterly time series data for 1981Q1 through 2010Q4. The results show that there is a stable, long-run relationship between foreign trade and economic growth. Also,the variance decomposition results show that the predominant sources of Nigeria economic growth variation are due largely to "own shocks" and foreign trade innovations.

In addition, Hashim and Masih (2020) examined the relationship between trade and economic growth in Malaysia with emphasis on both the role of exports and imports using Granger causality test. The results confirm the bidirectional long run relationships between the economic growth and exports, and economic growth and imports.

Studies by Albiman and Suleiman (2022) investigate the relationship among Export, Import, Capital Formation and Economic Growth in Malaysia using time series data from 1967-2010 and VAR analysis. Cointegration test results revealed no long run relationship among the variables. For causality analysis, export ratio and economic growth granger cause domestic investment. The impulse response function show that, the economic growth responds both positive and negative way depending on time period, due to the shock of domestic investment, import and export.

Simultaneously, Égert (2013) tests the Reinhart and Rogoff data set by using formal econometrics methods in order to see whether public debt has a negative nonlinear effect on growth if public debt exceeds 90% of GDP, the concludes that the negative relationship between debt and growth is sensitive to modelling choices including the time dimension, country coverage considered, data frequency and assumptions on the minimum number of observations required). Concentrating on advanced economies, Panizza and Presbitero (2020) survey the recent literature on the links between public debt and economic growth and conclude that although most empirical works using simple back-of-the-envelope calculations suggest the existence of a negative effect on economic growth, this effect is likely to be small.

Furthermore, the application of sophisticated econometric models often yields uncertain results on the relationship between debt and growth. Panizza and Presbitero (2022), in another study observed that a negative correlation between debt and growth does not by itself imply causality because low economic growth leads to high levels of debt. As regards the empirical estimations concentrating on the causality relations between debt and growth, recent empirical tests have provided some answers but they are still rather inconclusive. On one side, we have works supporting the (mostly negative) causality running from debt to economic growth. Among these contributions,

Chowdhury (2019) uses panel causality tests to analyse the impact of foreign debt on growthin low and middle income countries, covering 1982–2017, and concludes that the causality runs from debt to growth, with a significant negative causal impact of debt on growth.

Pattillo (2022) find evidence of a negative and significant causality effect running from total external debt to economic growth (even after accounting for the possible endogeneity of debt to the growth process). These authors also state that their results are shown to be compatible with a simultaneous significant effect of growth on debt ratios. On the contrary, some authors find empirical evidence that confirms the existence of

causality occurring between output growth and debt ratios. Representing this strand of the literature, Easterly (2022) maintains that lower growth decreases tax revenues and primary surpluses, and without adjustment, debt ratios will explode, as occurred after the worldwide slowdown in growth in the 1970s. This growth slowdown was an important cause of the debt crises in middle income countries in the 1980s, the crisis in highly indebted poor countries in the 1980s and 1990s and the increased public debt burden of industrialized countries in the samedecades.

Finally, there is also empirical support for both directions of causality between debt and growth. For instance, Abbas (2022) use a specific public domestic debt database, covering

93 low income countries and emerging markets over 1975–2020, and apply Granger causality regressions and panel data methods to test the relationship between debt and economic growth. They conclude that there is bidirectional and statistically significant causality; public domestic debt has a strong positive impact on per capita income and although not as statistically strong, economic growth also has a clear positive impact on public domestic debt.

Jayaraman and Lau (2019) apply panel Granger causality estimations to examine the relationship between external/public debt and economic growth in six Pacific island countries during 1985–2017. Their empirical results indicate a lack of evidence of a long-runGranger causality relationship between real output and the external debt to GDP ratio or between the same output index and the budget deficit to GDP ratio; however, in the short run, there is a significant causal relationship running from external debt and also budget deficit to output. In regard to the reverse relationship, in the long run, the results also point to the absence of causality; and in the short run, there is evidence of Granger causality running from output to external debt but not from output to public deficit. Butts (2019) also empirically test the direction of the Granger causality relationship between economic growth and short-term external debt in 27 Latin American and Caribbean countries over the period 1970–2016. The main results of this work suggest the existence of bidirectional causality relationships between the two variables for several countries, which means that the performance of both variables is interrelated. There is also clear evidence that in the short and long run, Granger causality from economic growth to short-term external debt is present in 13 Latin American and Caribbean countries. Ferreira (2019) addresses the Granger causality relationship between public debt and GDP, more precisely between the growth in real GDP per capita and public debt, represented by the current primary surplus/GDP and gross government debt/GDP ratios. By using OECD annual data for 20 countries between 1988 and 2001, clear Granger bidirectional causality was found.

Sulaiman and Azeez (2022) studied the effect of external debt on the economic growth of Nigeria using gross domestic product as the endogenous variable measuring economic growth as a function of ratio of external debt to export, inflation and exchange rate proxy as the exogenous variable. Data were gathered covering 1970-2020. Analysis of date was done using the econometric technique of ordinary least square. The result showed that externaldebt has contributed positively to Nigeria economy. A similar research was done by Iya, Gabdo, and Aminu (2013) with the same result. Ogege and Ekpudu (2010) examined the impact of debt burden on the Nigerian economy using time series data from 1970-2007. Ordinary least square (OLS) was used to test the relationship between debt burden and growth of the Nigeria economy. The result showed a negative relationship between debt stockof internal and external; and gross domestic product, meaning that an increase in debt stock will lead to a reduction on the growth rate of Nigerian economy.

Similarly, Momodu (2021) examined the correlation between debt servicing and economic growth in Nigeria. The study sought to find a relationship between the Gross Domestic product (GDP) and Gross Fixed Capital Formation of Current Market Prices (GFCF) using Ordinary Least Square multiple regression method. The study revealed that debt payment to Nigerian creditors has significantly impacted on the GDP and GFCF. Furthermore, Ezeabasili, (2019) studied the relationship between Nigeria's external debt and economic growth between1975-2015, with an error correction approach. Error correction estimate revealed that external debt has negative relationship with economic growth in Nigeria.

In a similar study, Bamidele and Joseph (2021) examined the effect of financial crisis, external debt management on the economic growth of Nigeria using GDP as endogenous variable while exogenous variables measuring economic growth were Foreign Direct Investment, external debt, external reserve, inflating, and exchange rate proxies. Annual time series of 1980-2018 were used. OLS, Augmented Dickey Fuller (ADF) unit roof tests and the Granger causality test were employed in analysis. The result showed a positive relationship between FDI and economic growth while inverse relationship existed between external debt and economic growth.

This study builds on the more recent time series data to examine the impact of export and import on economic growth in Nigeria. Morisset (2019) examined the effect of debt reduction within a macroeconomic Frame work

and tested various direct and indirect relationships between external debt, investment and economic growth. He estimated models and carried out simulations for Argentina during 1962-2017 using the three-stage least squares method. In order to explain the drastic reduction in private investment, some direct and indirect channels are considered. It is argued by most authors that if private sector is credit rationed, then the high level of foreign debt affects productive investment through a disincentive effect. Since the government in most debtor countries appeared unable (or unwilling) to meet increasing debt-service payments, private investors anticipated higher rates of taxation on real and financial assets as well as more instability in the economic environment. These changes affected private investment negatively through the debt overhang effect, which refers to the reduced incentives to invest. In addition, as foreign assets become more attractive relative to domestic assets, this often led to an increase in domestic interest rates, reducing private investment further.

The results show that the effect of 30% debt relief is 2.43 % and 5.40% on GDP level for thefirst and the fifth year respectively, since debt reduction includes a liquidity effect and an incentive effect; the liquidity effect includes the reduction in net transfers and the incentive effect comes from decline in the stock of debt. Thus, from the perspective of the debtor country as a whole, the debt overhang acts like a high marginal tax rate on the country lowering the return to investment and providing a disincentive to domestic capital formation. The external debt of developing countries is not a primary cause of economic slowdown. The results of this study support this claim and it is also argued that there is no urgent need for establishing an international institution for organising debt relief and debt rescheduling negotiation between indebted developing countries and their private creditors. The direct effect of the public and publicly external debt on GNP is negative for Latin America.

3.0 METHODOLOGY

To achieve the objective of the study, the paper specified a vector autoregressive model, used time series data from 1980 – 2023 of the variables captured as proxies for the study.

3.1 Model Specification

The general form of the model can be stated as: $P_t = V_i M_t + \varepsilon_t$ (3)

where

P_t = RGDP

M_t = (EXP, IMP,, EXR EXTD)

V_i = coefficients of each independent variables

This study adopts Mohamed, Liew and Mzee (2012) and Ojo, (2016) models, Which is supported by the neoclassical theories to examine the impact of international economicinteraction on economic growth in Nigeria, using the VAR model

The VAR model specified is:

$V_t = a + \sum_{k=1}^{\infty} A_i V_{t-1} + \mu_t$ (1)

α = intercepts of autonomous variables

A_i = matrix of coefficients of all the variables in the model. V_{t-1} = vector of thelagged variables. μ_t = vector of the stochastic error terms

In fact, both growth theories including neoclassical and endogenous theories have shown that, domestic investment, export and imports reinforce each other in determining the economic growth. Furthermore, the growth theories, especially endogenous growth theory show that, export, imports and domestic investment have long run equilibrium relationship with the economic growth. Therefore, the import-export-led growth model can be expressed in the form of multivariate linear model as here under:

In addition, theoretically, rise of imports especially of capital goods and inputs foreign technology would enhance domestic investments which would result into expansion of exports and higher economic growth. The increase in exports would result to increase the accumulation of foreign exchange, which in turn will increase imports and accelerate economic growth. Since there are many variables that exist in growth models that can be relevant to this analysis and for the fact that the VAR in multivariate systems requires sufficient number of observations, to that effect external debt was captured as additional variables in the model.

Based on our conceptual framework calibration of some economic variables and the theoretical arguments, we specify our equation based on extension of the works of Mohamed, Liew and Mzee (2016) and Albiman and Suleiman (2021) assertion on model building by including exports, imports, and to make relevance our investigation of economic interaction, exchange rates and external debt variables are captured in the model.

The VAR model is therefore expressed as:

$$P_t = \alpha + \beta_i P_{t-1} \ldots\ldots\ldots\ldots\ldots + \beta_p P_{t-p} + \varepsilon_t \quad (4)$$

$\varepsilon_t$is a white noise error termThe reduced form VAR is given as

$$P_t = \alpha + \sum_{i=1}^{n} \beta_i P_{t-p} + \varepsilon_t \quad (5)$$

where α is a vector of constant, p denotes the maximum lag length, β_i are n × n parametercoefficients and ε_t is a vector of error terms.

The model in its explicit form can be rendered as:

$$GDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} GDP_{t-1} + \sum_{i=1}^{n} \alpha_{2i} EXP_{t-1} + \sum_{i=1}^{n} \alpha_{3i} IMP_{t-1} + \sum_{i=1}^{n} \alpha_{4i} EXTD_{t-1} + \sum_{i=1}^{n} \alpha_{5i} EXR_{t-1} + \varepsilon_t \quad (6)$$

where

$RGDP_t$ = Real Gross Domestic ProductEXP_{t-1} = Export

IMP_{t-1} = Import

$EXTD_{t-1}$ = External debt stockEXR_{t-1} = Exchange Rate

Apriori Expectation

a1 is expected to be positive i.e. $\alpha_1 > 0$ which implies that, as the volume of export interaction increases there will be increase in economic growth, α_2 is expected to be negative i.e. $\alpha_2 < 0$ because import interaction is regarded as a withdrawal from the economy., α_3 is expected to be positive i.e. $\alpha_3 > 0$ and a4 is expected to be negative or positive i.e. $\alpha_4 <$ or > 0 because when exchange rate increases worth of the local currency is expected to decrease, this will bring about inflation and eventually reduces GDP and vice versa . This is similar to external debt; it could be negative or positive either in the short or long run.

4.1 Result Presentation and Discussion of Findings

The analysis for this study is econometric method in nature and presents the results ofequation.

Analysis of Regression Results

Augmented Dickey Fuller (ADF) unit root test

Table 4. 1: ADF Unit Root Test

Variables	Level	First Difference
$Exch_t$	0.4431	-4.2251*
Exp_t	-0.6007	-7.3114**
Gdp_t	3.90238	-5.5531*
Imp_t	1.8222	-6.7368*
$Extd_t$	-2.6627	-5.8567*

Note. *, **, * significant at 1%, 5% and10% respectively**
Source: Author's Compilation (2024)

The Augmented Dickey Fuller (ADF) unit root test results in Table 1 above revealed that all the variables:R GDP, exports, imports, exchange rate and external debt are not stationary at level but at first difference. In other words, all series under the study, are integrated at order one, i.e. I(1). This means that the mean and variance are not constant.

(a) Analysis of Johansen Cointegration Results

Table 4. 2: Johansen's multivariate cointegration test results

Hypothesized No. of CE(s)	Eigen value	Trace statistic	Critical Value	P value	Max-eigen statistic	Critical value	P value
None *	0.7675	68.1742	47.8561	0.0002	48.1394	27.5843	0.0000
At most 1	0.3993	20.0345	29.7971	0.4205	16.8186	21.1316	0.1807
At most 2	0.0895	3.2159	15.4947	0.9562	3.0924	14.2646	0.9404
At most 3	0.0037	0.1235	3.8415	0.7252	0.1235	3.8415	0.7252

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
***denotes rejection of H0 at 5% significant level, ** denotes p-values**
Source: Author's data Analysis (2007)

The results of Johansen's multivariate cointegration test in table 2 above shows that there exists one cointegration equation amongst the variables and both the trace statistic and maximum Eigen value statistic exceeded the critical values at 5% level. This confirms the existence of co-integrating among the variables and follows a common long run path. Since the variables are co-integrated, the existence of a long-run relationship between the real RGDP, exports, imports, external debt and exchange rate is confirmed. Thus, long-run relationship indicates that all explanatory variables are elastic and their variations will bring about more than proportionate change in the level of RGDP. The policy implication that can be inferred from the findings is that there is need to diversify the export base and reduce importation of goods and materials in Nigeria.

Table 4:3 Vector Autoregression EstimatesStandard errors in ( ) & t-statistics in [ ]

	GDP	EXCH	EXP	IMP	EXTD
RGDP(-1)	0.818359			0.132932	
	(0.18691)			(0.02608)	
	[4.37832]			[5.09689]	
RGDP(-2)	-0.460541		-0.247857	-0.166196	
	(0.19842)		(0.05005)	(0.02769)	
	[-2.32110]		[-4.95243]	[-6.00289]	
EXCH(-1)		0.881962			
		(0.21991)			
		[4.01052]			
EXP(-1)	-2.309760		0.739318	-0.304238	
	(0.91570)		(0.23097)	(0.12777)	
	[-2.52241]		[3.20091]	[-2.38109]	
EXP(-2)	2.862412			0.696556	
	(0.92719)			(0.12938)	
	[3.08720]			[5.38396]	
IMP(-1)				0.728291	
				(0.19638)	
				[3.70853]	
IMP(-2)			1.182589		
			(0.38516)		
			[3.07041]		
EXTD(-1)					0.685237
					(0.19675)
					[3.48277]

Source: Author's data Analysis (2024)

4.4. Results of Forecast Error Variance Decompositions

The forecast error variance decomposition was used to estimate the short run dynamic properties of each of the variable originating from shocks in the system. It is the proportion of forecast error variance for each variable that is attributable to its own innovation and to innovations in the other endogenous variables. The ordering of the variables in the variance decomposition is stated in Table 5a - d below over the same forecasting horizon for a period of ten years (10).

Variance Decomposition of GDP

Table 4.4.:Variance Decomposition of GDP

Period	S.E	GDP	EXCH	EXP	IMP	EXTD
1	3350.769	100.0000	0.000000	0.000000	0.000000	0.000000
2	4596.513	77.15771	12.23303	7.229645	2.806634	0.572980
6	9044.799	61.60479	8.439815	19.04244	9.381386	1.531566
10	15664.29	25.58935	13.40933	50.12602	9.905758	0.969545

The variance decomposition of economic growth (RGDP) shows that the high level of the variation experienced by RGDP is attributed to its own shock at 100% in the first period and falls to 25.59 at the end of the 10-period horizon. The contribution of the other 4 variables is quite marginal. The highest is by export (EXP), which contributes 50.13% in the tenth period.

Variance Decomposition of EXCH

Table 4.5:Variance Decomposition of EXCH

Period	S.E	GDP	EXCH	EXP	IMP	EXTD
1	14.88132	10.20798	89.79202	0.000000	0.000000	0.000000
2	21.50967	9.932061	85.44828	2.886753	1.529602	0.203308
9	51.14555	4.788662	75.94881	12.30410	1.119987	5.838436
10	54.23882	5.981687	74.94009	12.57459	1.109514	5.394113

The exchange rate (EXCH) displayed a similar pattern where its own shocks account for a disproportionate share of the total variation. The contribution of its own shock is 89.79% in the first period and falls to 74.94% in the tenth period. The contribution of the other 4 variables is marginal with export (EXP) accounting for 12.57% of the variation.

Variance Decomposition of EXDT

Table4. 6: Variance Decomposition of EXDT

Period	S.E	GDP	EXCH	EXP	IMP	EXTD
1	15.18254	0.988028	3.444111	0.678046	5.300788	89.58903
2	18.66302	1.333556	5.968400	0.459665	5.109182	87.12920
9	19.53698	2.418301	9.706164	0.580964	5.036180	82.25839
10	19.69361	2.827105	10.50462	0.596004	4.958590	81.11368

The variance decomposition of external debt shows has a similar trend of high level of variation. The contribution of its own shock is 89.59% in the first period and falls to 81.11% in the tenth period. The contribution of the other 4 variables is marginal with exchange rate (EXCH) accounting for 10.50% of the variation in the tenth period.

Variance Decomposition of EXP

Table 4.7 Variance Decomposition of EXP

Period	S.E	GDP	EXCH	EXP01	IMP	EXDT
1	845.1851	26.44229	3.435489	70.12222	0.000000	0.000000
2	1108.292	32.18997	2.313176	65.29177	0.190812	0.014272
9	3827.327	36.10167	18.75280	37.18197	3.929814	4.033738
10	4507.871	43.05387	21.54841	27.37446	2.840244	5.183009

Export (EXP) shock shows a different pattern. Although the shocks of exports account for 70.12% of total variation in the first period, its contribution falls drastically to 27.37% in the tenth period. In the tenth period, shocks in the RGDP account for 43.05% of the variation while shocks in exchange rate (EXCH) account for 21.55% of the variation.

Variance Decomposition of IMP

Table 4.7: Variance Decomposition of IMP

Period	S.E	GDP	EXCH	EXP01	IMP	EXDT
1	467.5534	57.09421	0.257702	9.565085	33.08300	0.000000
2	765.3560	67.09407	8.408708	5.644511	18.85148	0.001228
9	2052.066	23.53818	20.66112	45.29227	8.560023	1.948404
10	2439.088	30.07438	21.28235	39.83020	6.059660	2.753411

The pattern of variance decomposition of import (IMP) is rather similar to that of export (EXP). Import (IMP) own shocks account for 33.08% of the variation in the first period, its contribution falls sharply to 6.06% in the last period while export (EXP) and economic growth (GDP) shocks account for 39.83% and 30.07% of the variation respectively.

In conclusion, the predominant sources of variation in the rate of economic growth are due largely to own shocks and innovations in exports which is in line with the submission of Arodoye and Iyoha (2021) while the predominant sources of variation in exchange rate are due mainly to own shocks and innovations in exports. Also, the predominant sources of variation in inflation are due mainly to own shocks and innovations in exchange rate. Similarly, the predominant sources of variation in exports are due largely to own shocks and innovations in the GDP and exchange rate while the predominant sources of variation in imports are due mainly to own shocks and innovations in exports and GDP.

Response to Cholesky One
S.D. Innovations ± 2 S.E.

4.4.1 Impulse Response Function Analysis

Figure 1: Impulse Response Function Graph

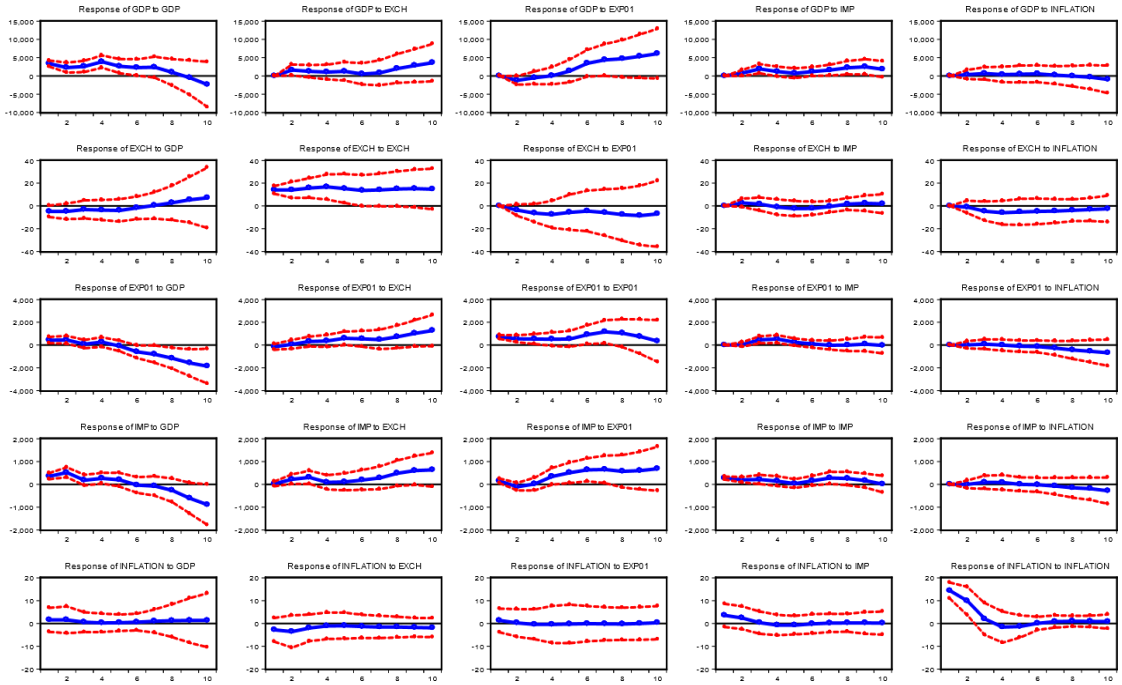


Figure 1 illustrates the results of IRF analysis of economic growth and exchange rate, export, import and external debt in the VAR system to one standard deviation of shock. When there are positive shocks to the economic growth, the exchange rate, export, import and inflation are found to respond negatively but insignificant from the period one to the fifth period. Beyond the fifth period (year five), the negative effects of the shocks became significant until the ninth period. On the other hand, when there are positive shocks to exchange rate, export, import and inflation, the economic growth also shows significant negative responses. The effect begins contemporaneously and lasts after four periods beyond which, it becomes insignificant. The results imply that the sudden increase in economic growth rate and exchange rate, export, import and inflation will contribute to the adverse effect to the other. The estimated generalized impulse response functions (IRFs) results showed that economic growth responds both positive and negative way depending on time period, due to the shock of EXCH, EXP, IMP and EXDT Nigeria as an open economy, to ensure effective utilization of domestic resources, there is need for new policies to ensure that import and export re enforce each other in promoting economic growth over long run.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study examined the impact of Nigeria external economic interaction on economic growth, disaggregated into; export, import external debt and exchange rate. The paper used time series data from 1980-2023. VAR model was specified and analysis. The results of Johansen Cointegration test showed that there is a long run relationship between the variables. The results of the forecast error variance decomposition analysis showed that innovations in the variables are mostly explained by their own shocks. While the impulse responses of gross domestic product, exchange rate, export, import and domestic debt with respect to the identified shocks (innovations) are consistent with the results of variance decomposition analysis. Based on the results obtained, it implies that there is a positive relationship between export-import and economic growth in Nigeria. In conclusion, Major policies have to be reformed to ensure long run impact of external economic interactions on economic growth.

5.2 Recommendations

On the basis of the empirical analysis, the following policy recommendations are made:

- Appropriate trade and foreign exchange policies in favour of export expansion should be encouraged because exports drive economic growth. Nominal exchange rate also revealeditself as a strategic and versatile variable for influencing economic growth.
- Proper implementation of import control measures that will certainly sharpen the understanding of the determinants of import behaviour.
- Proper channelling of external debt to real sectors of the economy to spur increase Inngeneral output level.

REFERENCES

Abass M (2022). Domestic debt and the Nigeria economy . *Journal of EconomicTheory*,2(2),20 - 43

Adesuyi, O.O. and Odeloye, O.D. (2019) Foreign Trade and Economic Growth in Nigeria (1980-2010). Journal of Economics and Sustainable Development, 4(13): 73-88.

Ajayi, S.I. (2011) "Econometric Analysis of Imports Demand Function for Nigeria." The Nigerian Journal of Economics and Social Studies (NJESS), 17: 67- 91.

Albiman, M. and Suleiman, N.N. (2021) The Relationship among Export, Import, Capital Formation and Economic Growth in Malaysia. Journal of Approach. '*International Journal of Business and Management* 6.(5), 16-170

Arodoye, N.L. and Iyoha, M.A. (2014) Foreign Trade-Economic Growth Nexus: Evidence fromNigeria. CBN Journal of Applied Statistics, 5(1): 121-141.

Barnidele,. T.B & Joseph, A.I. (2013) "The impact 'of Financial Deepening and Foreign Direct investment in Nigeria, International Journal of Economic development, 7(3), 109 - 124

Butts, J.O. (2019), Federal Income Taxation and External. Vs. Internal debt, International journal of Finance, 6(2), 90-110

CBN (2019) Annual Report and Statistical Bulletin.

Darrat, A. (2020) Are Exports an Engine of Growth? Applied Economic, 19(2): 277-283.

Eleje, E.O. and Emerole, G.A. (2019), "Development Financing for Growth: Experience". *African Journal of Stability and Development*. 4(2), 73-90

Ferrera, A. (2019): "Exploring the Nexus between External Debt Management and

Financing Journal of Finance 4(3), 197-205.

Global Economics, 4(2): 2375-4389. http://dx.doi.org/10.4172/23754389.1 000186.

Goldar, B.N. and Bharadwa, R.N. (1985) "Determinants of Iron and Steel Exports." The Developing Economies, XXIII(1).

Hashim, K. and Masih, M. (2020) What causes economic growth in Malaysia: exports or imports?

Munich Personal RePEc Archive (MPRA), INCEIF, Malaysia, 14 August.

Jayraman.O. and Sulaiman, S.A. (2019) "External Debt, Economic Groh and Investment in Nigeria*". European Journal of Business arc Management. Journal of Economics* 2(7): 195-205

Kruger, A.O. and Ito, T. (2000) Growth theories in light of East Asian Experience. London: University of Chicago Press.

Langley, K.M. (2000) The External Reserve Factor in Nigerian Economic Development. The Journal of Economic and Social Studies, 10(6): 151.

Liew, C. and Mzee, S.S. (2016) Export Trade and Economic Growth in Tanzania: A Disaggregated Approach.

Mankiw, G.N., Romer, D. and Weil, D.N. (1991) A contribution to the empirics of economic growth.

Quarterly Journal of Economics, 107(2): 407–437.

Nigerian Economy" URL:http://www.ijssc.com/ijer/sites/default/files/ - No.1.

Ogbeifun, M.I (2007), "The Politics of External Debt Relief: Nigeria's Unique

Ojo, O.J. (2015) An Empirical Investigation of Capital Flight in Selected African Countriesí, Abidjan African Development Bank, Economic Research Papers, No. 17.

Omoke, P.C. and Ugwuanyi, C.U. (2016) Export, Domestic Demand and Economic Growth in Nigeria: Granger Causality Analysis. European Journal of Social Sciences, 13(2): 211-218.

Onitiri, H.M.A. (2011) The Marketing Board System: Proceedings of an International Conference, Nigerian Institute of Social and Economic Research, Ibadan, Nigeria.

Oyejide, T.A., Ogunkola, E.O. and Ndungu, N.S. (2001) Trade, investment growth in Africa: Patterns, trends and puzzles. A report submitted to the African Economic Research Consortium, Nairobi, Kenya.

Panizza O.J(2019). "External Debt Relief aid Economic Growth in Nigeria". *American* papers/2013/vli2/4-paper.pdf

Pattio. (2020). "Nigeria's External Debt and Economic Growth: An error correction.

Journal of International Trade and Economic Development, 9(3): 101-120.

Safdari, M. (2017) The Relationship between Foreign

Trade and Economic Growth in Iran. American Journal of Scientific Research, 6(4): 110-131.

Sulaiman, L.A, and Azeea, B.A. (2022) "Effects of External Growth of Nigeria", *Journal ofEconomics and Sustainable Developmen*t,3(1), 71-79

Sun, P. and Heshmati, H. (2017) International Trade and its Effects on Economic Growth in China,IZA DP Discussion Paper No. 5151, August.

Umaru l .(20l3). Externa1 debt and Domestic Impact on Economic Growth, *Journal of International Trade and Economic Development*, 3(7): 121-30.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ENHANCING SUSTAINABLE FISHERIES THROUGH THE STUDY OF MORPHOLOGY AND REPRODUCTIVE ASPECTS OF *GYMNARCHUS NILOTICUS* IN THE NIGER RIVER, LOKOJA, NIGERIA

[*1,2]Sadiq, H. O., [2]Afolabi, A. O. [3]Agubosi, O. C. P., [3]Aliyu, K. I. and [2]Ajibade, M. O.
[1]Centre for Research, Innovation, Development and Entrepreneurship (CRIDE), United Kingdom
[2]Department of Fisheries, Aquaculture and Wildlife, University of Abuja
[3]Department of Animal, University of Abuja
[*]Corresponding author: hauwa.sadiq@uniabuja.edu.ng,

ABSTRACT
The morphology and gonadosomatic index (GSI) of *Gymnarchus niloticus* were evaluated from specimens collected in the Niger River at Lokoja, Kogi State, Nigeria. A total of 40 specimens, with total lengths from 80.00 to 107.66 cm and total weights from 620.17g to 1135.82g, were collected. Morphometric parameters, meristic characteristics, and gonadosomatic index (GSI) were analysed using ANOVA and Duncan's Multiple Range Test. In this study, significant differences were observed in body weight (620.17g – 1135.82g), standard length (69.00cm – 92.0cm), eye diameter (1.15cm – 1.93cm), and dorsal fin length (89.0cm – 144.0cm). The GSI results revealed that *G. niloticus* exhibits significant seasonal variation in reproductive activity; the species has unpaired gonads and a gonochoristic reproductive pattern. Although the species has low fecundity, it has large ova, suggesting that, it can be a suitable candidate for aquaculture. This species of fish is a potential candidate for achieving sustainable development goal (SDG) 2 (Zero Hunger), 6 (Clean Water and Sanitation), 12 (Responsible Consumption and Production), and 14 (Life below Water) in Nigeria.

Keywords: *African Knife fish, Morphometric parameters, Reproductive biology, Sustainable fisheries*

1.0 INTRODUCTION
In many developing countries around the coastal regions, fish is usually one of the easily accessible and cheap sources of animal protein (Sadiq *et al*., 2022). Fish like other aquatic organisms constitute a huge contribution to food as well as nutritional security in many African countries where many people are poor and undernourished (Chan *et al*., 2019). The exceptional blend of high-quality protein and other essential nutrients makes fish a unique valuable food. It is a good source of animal protein, it is estimated that about 140/150g of fish provides nearly 60% of the daily protein requirements of man, this is in addition to other essential nutrients which are non-existent or insufficient in other protein sources like cereals and meat (Sadiq *et al*., 2022). The study of the biology of fish species enables the primary and relevant knowledge to be obtained for the survival, growth, continuity and sustainability of life (Agbugui, *et al.*, 2021a).

Gymnarchus niloticus, belonging to the family Gymnarchidae and commonly known as the African knife fish or Aba, is a freshwater species, prevalent in the inland waters of West Africa, spanning from Senegal, Gambia, Chad, the Nile, Niger and Lake Turkana (Lalèyè *et al.*, 2020 and Froese and Pauly, 2014). *Gymnarchus niloticus* is harvested from the wild for subsistence fisheries and has considerable economic and socio-cultural values in Nigeria; the flesh of the species commands a high price in local markets (Olopade and Taiwo, 2013, Agbugui *et al.*, 2021b). While *G. niloticus* is of least concern across the rest of Africa, it has been categorized as endangered in Nigeria and this is due to decline brought on by overfishing, habitat loss, irregular and uncontrolled fishing techniques, and human activities along the river (Agbugui and Umaru, 2020). Despite its importance, there is a paucity of detailed studies on the biological and ecological characteristics of *G. niloticus*, particularly its morphometric and reproductive traits especially in the Niger River at Lokoja, Kogi State. Important steps must be taken to improve the conservation of this species, safeguarding its habitat, breeding, production, culture, and commercial propagation in order to prevent the extinction of this highly prized and commercially valuable fish. *Gymnarchus niloticus* has an elongated body with a dorsal fin that runs through almost the entire length of the fish and has no pelvic, anal or caudal fins (Agbugui *et al.*, 2021b). It hunts and stuns its preys using weak electric currents from its body (Olopade and Taiwo, 2013). The gonadosomatic index (GSI) is a useful tool in fish reproductive studies, providing insights into the breeding season, fecundity, and overall reproductive health of fish populations (Sadiq *et al.*, 2022). There is a need to shift from catfish culture in Nigeria to meet fish demands of the nation populations, hence, it is very imperative to search for suitable aquaculture candidates especially if Nigeria is to achieve her sustainable development goals of zero hunger and life below water. This study therefore, was aimed at evaluating the

morphology and some reproductive aspects of *Gymnarchus niloticus* in the Niger River, Lokoja, Nigeria.

2.0 MATERIALS AND METHODS

Fish samples were collected from fishermen at landing sites by the Niger River at Lokoja, Nigeria. Lokoja lies between 7° 48' 59.99" N latitude and 6° 44' 59.99" E longitude (fig 1) (Iyaji and Yaro, 2016). The fish samples were then transported in ice box to the Animal Science laboratory, University of Abuja.

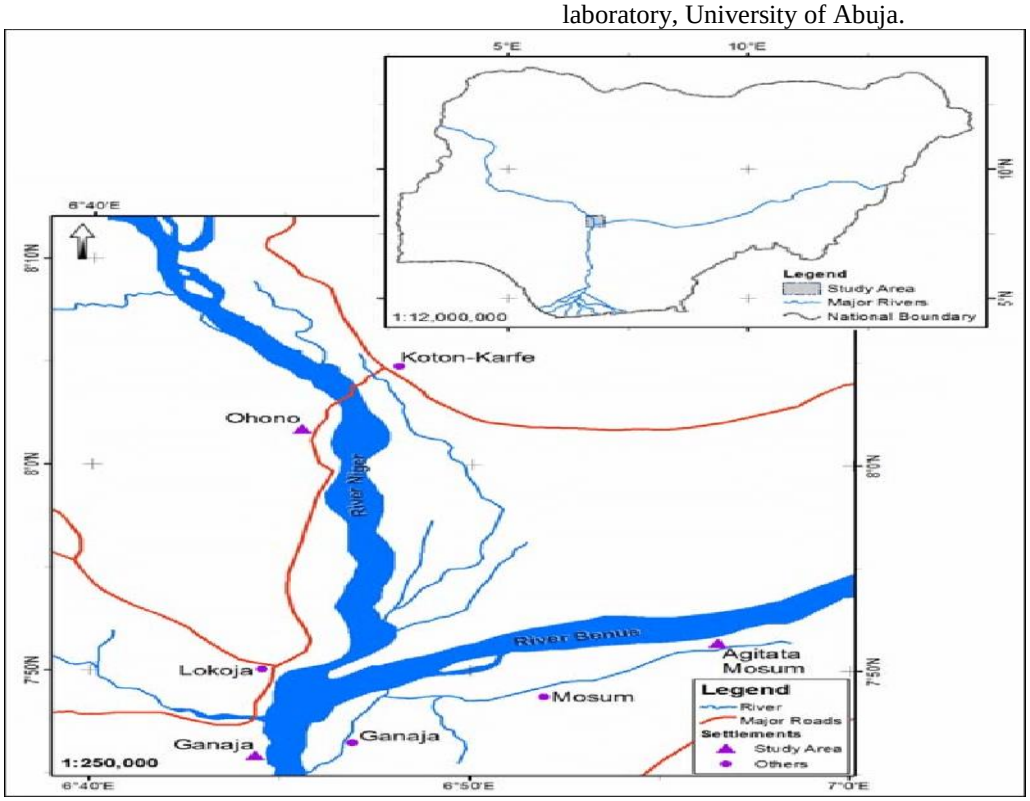


Figure.1: Map of the study area (Iyaji and Yaro, 2016) Mag: x0.4

Specimen Collection

Forty mixed species of *G. niloticus* were collected from fishermen at the landing sites by the water body between October 2023 and December 2023. The fish were washed under running water before they were weighed using a camry digital scale (0.5g – 5kg) and morphometric parameters measured using a transparent metric ruler (0 – 30cm). Morphological parameters measured and recorded were; total length (TL), standard length (SL), head depth (HD), head length (HL), body depth (BD), body width (BW), snout length, eye diameter (ED), width of caudal peduncle, and fin lengths (FL).

Sexing of the fish samples were done by physical examination of the cloacae on the ventral side of the fish and were confirmed after dissection. Following the procedures of Agbugui *et al.* (2021a) and Adebiyi et al. (2011), gonads were carefully detached, weighed, and maturity stages assigned to each sample on established criteria and GSI values were calculated to determine reproductive status. The GSI was determined using the following formula:

$$\text{GSI} = \frac{Weight\ of\ gonad\ (g)}{Weight\ of\ fish\ (g)}\ x\ 100$$

Statistical Analysis

Recorded and collected data were subjected to analysis of variance (ANOVA) using SPSS Version 17.0. Significant differences were separated using Duncan's Multiple Range Test.

3.0 RESULTS AND DISCUSSION

Morphological Characteristics

Fish sampled in November were significantly larger than to those sampled in both October and December (Table 1). This difference was also noticed in other morphological characteristics such as; total length, head length, and body depth across the sampling months except eye diameter. These variations are likely influenced by environmental factors such as water temperature, food availability, and breeding cycles

within the Niger River at Lokoja. Other researchers have also suggested that, net mesh size and age of fish can also be responsible for the observed variations (Olopade and Taiwo, 2013; Mohammed et al., 2019).

Table 1: Morphological characteristics of *Gymnarchus niloticus* from Niger River, Lokoja

Parameters	October	November	December	SEM
BWG (g)	795.14^{ab}	1135.82^{a}	620.17^{b}	10.42
TL (cm)	91.00	107.66	80.00	10.32
SL (cm)	83.33^{ab}	92.00^{a}	69.00^{b}	4.01
HL (cm)	12.66	17.53	10.00	1.79
HW (cm)	9.50	11.15	7.50	1.34
HD (cm)	7.60	8.52	6.00	1.07
ED (cm)	1.67^{b}	1.93^{a}	1.15^{a}	0.13
SNL (cm)	7.60	10.85	6.00	1.13
BD (cm)	9.50	13.15	7.50	1.34
BW (cm)	12.66	17.53	10.00	1.79
CPD (cm)	0.97	28.88	0.83	9.34
CPL (cm)	14.10	14.90	8.50	2.15
DBL (cm)	15.83	21.91	12.50	2.24
DFL(cm)	100.00^{b}	144.00^{a}	89.00^{c}	11.28

^{abc}Means in the same row with different superscripts differ significantly (P<0.05).
SEM = standard error of mean, BWG = body weight, TL = total length, SL = standard length, HL = head length, HW = head width, HD = Head depth, ED = eyes diameter, SNL = snout length, BD = Body depth, BW = body width, CDP = width of caudal peduncle, CPL = length of the caudal peduncle, DBL = dorsal base length and DFL = dorsal fin length.

Meristic characteristics of *Gymnarchus niloticus* in Niger River, Lokoja

Table 2 revealed the meristic characteristics of *Gymnarchus niloticus* in Niger River, Lokoja. The pectoral fin rays (PFR), dorsal fin rays (DFR), Dorsal fin rays (DFR), caudal peduncle scale (CPS), transverse scale (TS), predorsal scale (PS) values. All the parameters evaluated did not vary statistically (P>0.05) across the months except caudal peduncle scale.

Table 2: Meristic characteristics of *Gymnarchus niloticus* from Niger River, Lokoja

Parameters	October	November	December	SEM
DFR	46.66	62.66	72.00	8.58
CPS	75.00^{b}	76.66^{b}	103.33^{a}	5.37
TS	33.00	31.00	34.00	0.64
PDS	8.66	8.66	9.00	0.27

^{abc}Means in the same row with different superscripts differ significantly (P<0.05)
SEM = standard error of mean, DFR = dorsal fin rays, CPS = caudal peduncle scale, TS = transverse scale, PS = predorsal scale.

Stages of gonad developments observed in G. *niloticus* from Niger river, Lokoja

The stages of gonad development in G. *niloticus* are presented in Table 3. No records were documented for the immature and the spent stages. *Gymnarchus niloticus* possesses a single ovary in the female and single testis in the male which is often referred to as unpaired gonad. Unpaired gonads are also reported in *Notopterus notopterus* and *G. niloticus* and (Opadokun and Ajani 2015; Agbugui *et al.*, 2021b) unlike most species with paired gonad structure. In this study, immature and spent gonads were not encountered during the sampling period. The numbers of gravid females (10) and mature males (4) encountered of the total number of fish caught during the sampling period suggests that the breeding period of the fish is from November to sometime after December. This fish has also been reported to be nest breeders which explained the number of gravid and matured fish sampled (Agbugui *et al.*, 2021b).

Table 3: Stages of gonad developments observed in G. *niloticus*

Gonads	Microscopic character	
	Testis	**Ovaries**
I. Immature	Not encountered	Not encountered
II. Quiescent	Testis were small and creamy in colour	The quiescent stage had ovaries that were translucent and creamy in colour, oocytes were not visible to the naked eye, blood vessels were seen on the surface of ovaries.
III. Maturing	The males had small milt that was milky in colour.	The maturing stage had ovaries that were amber in colour with reddish patches indicating the presence of blood vessels. Oocytes were translucent and were not visible to the naked eye, blood vessels were seen on the surface of ovaries
IV. Mature	The mature stage had larger milt that could be released with some pressure while the	Oocytes were amber and sometimes reddish in colour. Oocytes could be seen with naked eye and counted easily.
V. Running	Milt could be released with little pressure	Eggs could be released with little pressure
VI. Spent	Not encountered	Not encountered

Variation in Gonadosomatic Index of G. *niloticus* from Niger River, Lokoja

The Variation in Gonadosomatic Index of *G. niloticus* from River Niger at Lokoja, Nigeria is presented in Table 4. GSI values varied significantly across the months, with the highest values recorded in November. Females exhibited higher GSI values compared to males, indicating a synchronous breeding strategy (Flores et al., 2015). The significant variations in GSI across months suggest seasonal reproductive cycles, with peak breeding activity occurring in November. The GSI values of G. niloticus varied significantly across the months, with the highest values recorded in December. This suggests a peak in reproductive activity during this period, particularly among females. The observed morphological variations and high GSI values in December align with known breeding patterns, suggesting that *G. niloticus* has a distinct reproductive season in the Niger River. The knowledge and understanding of these patterns are crucial for developing effective aquaculture practices and ensuring sustainable utilization of this species.

Table 4: Variation in Gonadosomatic Index of G. *niloticus* from River Niger, Lokoja

Parameters	October	November	December	Males	Females
N	15	12	13	18	22
GSI	0.8 – 5.4	4.7 – 13.90	6.00 – 12.78	0.50 – 4.18	4.10 – 14.75
Mean±SD	3.5±0.33	9.78±0.41	7.68±2.15	3.0±1.20	7.62±2.08

N = number; GSI = gonadosomatic index; SD = standard deviation

4.0 CONCLUSION AND RECOMMENDATIONS

Gymnarchus niloticus from the Niger River at Lokoja exhibits significant morphological and reproductive characteristics that make it a potential candidate for aquaculture. The results from this study showed that *Gymnarchus niloticus* in the Niger River at Lokoja has peak breeding period in November as demonstrated by the GSI of sampled fish. This finding might inform policies by preventing overfishing and ensuring gear size restrictions during this period. *Gymnarchus niloticus* possesses desirable morphological and reproductive traits that support its potential for aquaculture. This species of fish is also potential candidate for achieving sustainable development goal (SDG) 2 (Zero Hunger), 6 (Clean Water and Sanitation), 12 (Responsible Consumption and Production), and 14 (Life below Water) in Nigeria. Further research on breeding habits, feeding habits, growth rates under controlled conditions, and disease resistance is essential to establish effective

culture procedures and contribute to the diversification of aquaculture species in Nigeria.

REFERENCES

Adebiyi, F. A., Siraj, S. S., Harmin, S. A., & Christianus, A. (2011). Ovarian development of a river catfish Hemibagrus nemurus (Valenciennes, 1840) in captivity. *Journal of Experimental Zoology, Part A: Ecological Genetics, Physiology, and Evolution* 315(1): 1-8.

Agbugui M. O. and Umaru J., (2020). *Gymnarchus niloticus* (Cuvier, 1830), a threatened fish species in the lower river Niger at Agenebode, Nigeria; the need for its conservation, *International Journal of Fisheries and Aquatic Research* **6 (**1): 54 – 65.

Agbugui, M. O., Abhulimen, F. E., & Adeniyi, A. O. (2021a). Abundance, distribution, morphometric, feeding evaluation and the reproductive strategies of *Gymnarchus niloticus* in the Lower River Niger at Agenebode, Edo State Nigeria. *Journal of Applied Science & Environmental Management* 25(3): 801-810.

Agbugui, M. O., Abhulimen, F. E., & Egbo H. O. (2021b). Gross Anatomy and Histological Features of *Gymnarchus niloticus* (Cuvier, 1829) from the River Niger at Agenebode in Edo State, Nigeria. *International Journal of Zoology*. 3151609: 7pp **https://doi.org/10.1155/2021/3151609**

Chan, C. Y., Tran, N., Pethiyagoda, S., Crissman, C. C., Sulser, T. B. and Phillips, M. J. (2019). Prospects and challenges of fish for food security in Africa. *Global Food Security* 20: 17 – 25.

FAO. (2020). The State of World Fisheries and Aquaculture. Food and Agriculture Organization of the United Nations.

Flores, A., Wiff, R., & Díaz, E. (2015). Using the gonadosomatic index to estimate the maturity ogive: application to Chilean hake (*Merluccius gayi gayi*). *ICES Journal of Marine Science* 72(2): 508-514.

Froese, R. and Pauly, D. (2014). *Gymnarchus niloticus* in FishBase. April 2014 version.

Iyaji, F. O. and Yaro, C. A. (2016). Monthly occurrence of nematode parasites of Synodontis species from rivers Niger-Benue confluence at Lokoja, Nigeria. *International Journal of Fisheries and Aquatic Studies* 4(5): 36 – 40.

Lalèyè, P. Azeroual, A.; Entsua-Mensah, M.; Getahun, A.; Moelants, T.; Vreven, E. (2020). "*Gymnarchus niloticus*". IUCN Red List of Threatened Species. 2020: e.T181688A134949091. doi:10.2305/IUCN.UK.2020-2.RLTS.T181688A134949091.en.

Mohammed, Z. B., Diyaware, M. Y., Umar, H. M., Agaji, M. I., & Aliyu, M. (2019). Sex identification in *Heterotis niloticus* (Cuvier, 1829) using morphometric and meristic characters from Alau lake, Borno State Nigeria. *FUDMA Journal of Sciences*, 3(3): 12-17.

Olopade, O. A., & Taiwo, I. O. (2013). Morphometric and meristic analysis of *Gymnarchus niloticus* (Teleostei: Gymnarchidae) from Oyan Dam and Epe Creek in South West, Nigeria. *African Journal of Tropical Hydrobiology and Fisheries* 14(2): 119-124.

Opadokun, I. O., & Ajani, E. K. (2015). Some aspects of the reproductive biology of *Gymnarchus niloticus* Cuvier, 1829 (Knifefish) in Lekki Lagoon, Nigeria. *International Journal of Fisheries and Aquatic Studies* 2(3): 166-170.

Sadiq, H. O., Igbani, F., & Akpan, M. A. (2022). Sex Ratio, Gonadosomatic Index and Fecundity of *Malapterurus electricus* in Upper Benue River in Ibi, Taraba State. *Nigerian Journal of Tropical Agriculture* 27(2): 377-384.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

MONETARY POLICY AND MANUFACTURING SECTORS' PRODUCTIVITY IN NIGERIA: IMPLICATION FOR EFFECTIVE PARTICIPATION OF DOMESTIC INDUSTRIES IN AFRICAN CONTINENTAL FREE TRADE AGREEMENT

[1*]Onwudinjo Louis Ejike; [2]Agbo Constance Chichebe & [3]Ofodu Lilian Nnenna
[1]Department of Agricultural Extension and Management, Enugu State Polytechnic, Iwollo, Nigeria
[2]Department of Cooperative Economics & Management, Enugu State Polytechnic, Iwollo, Nigeria
[*]Email: ejikonomics@yahoo.com Phone: +2348030888988

ABSTRACT
This study focused on the effects of monetary policy on manufacturing sector productivity in Nigeria. The main objective of the study was to empirically investigate the impact of monetary policy on manufacturing sectors' of Nigeria economy. It also accessed the causality relationship between manufacturing sectors' output and monetary policy variables in Nigeria. Multiple Regression Method of Analysis was used. Based on the scope, ex-post factor research design was adopted for the analysis using data obtained from CBN statistical bulletin 2017. The model utilized the log transformation of manufacturing sectors' output contribution to gross domestic product (LNMGDP) as a proxy for manufacturing sectors' output while log(s) of interest rate (LNINTR), broad money supply (LNM2), and cash reserve ratio (LNCRR) as proxies for monetary policy. The major findings from the study, revealed that interest rate, broad money supply and cash reserve ratio exerted a negative impact on manufacturing sectors' output in Nigeria, but only broad money supply was statistically significant over the period covered owing to its corresponding coefficients from the VAR multiple regression model conducted. In addition, the Granger causality test results showed that there is no significant directional causality relationship between monetary policy variables and manufacturing sectors' output in Nigeria for the same period under study. Therefore, we recommend that the monetary authority should target single-digit interest rate in order to encourage manufacturing sector's productivity in Nigeria and boost output performance of the manufacturing sector of the Nigerian economy to participate actively in African Continental Free Trade Agreement (AFCTA).

Keywords: *Free Trade, Manufacturing Sector, Monetary Policy, Productivity*

1.0 INTRODUCTION

Monetary policy refers to 'all the measures undertaken by the monetary authorities to produce a deliberate impact upon the nature and volume of money to achieve certain objectives of economic policy. To define monetary policy in specific terms, it is the control of availability, cost and the use of money and credit' (Onwudinjo, 2024). One of the most salient traditional functions of the Central Bank is to manage the nation's money and economy through the issue of various monetary policies. Thus, it is the central bank of every nation that is the monetary authority responsible for formulation and implementation of monetary policy. "Monetary policy includes all monetary decisions and measures irrespective of whether their aims are monetary or non-monetary and all non-monetary decisions and measures that aim at affecting the monetary system" (Cauvery et al, 2013). 'Thus, in a nutshell, monetary policy entails the use of official instruments of only the central bank to regulate the availability, cost and use of money and credit to achieve certain well defined objectives like full employment, price stability, increase in national output etc. Monetary policy is a major economic stabilization weapon which involves measures designed to regulate and control the volume, cost, availability and direction of money and credit in an economy to achieve some specified macroeconomic policy objectives. Monetary policy can be contractional or expansionary depending on the policy objective of the monetary authority at that particular point in time' (Onwudinjo, 2024).

Monetary policy has a rich past history and in the pre-Keynesian days it was the single established instrument of macroeconomic policy. Before the publication of Keynes 'General Theory' in 1936 when many countries were under gold standard, monetary policy was aimed at maintaining fixed exchange rates against other currencies. 'In the old quantity theory of money, according to which changes in the aggregate money supply affected the general price level rather than output and employment, monetary policy occupied a dominate role. However, the great faith placed on monetary policy in the nineteenth century was lost during Great Depression of 1930s'. This was due to the failure of monetary policy to prevent the depression. The fiscal policy oriented by Keynesian revolution was another reason for the fall of monetary policy and the emphasis was shifted to fiscal measures. "However in the early 1950's, monetary measures were revived due to the development of inflationary pressures all over the world. Monetary economists now believe that monetary policy influences the economy through its effects on the

availability and cost of credit; and hence the scope of monetary policy has been considerably widened and it is being recognized that both monetary and fiscal policies together regulates the level of output and the price level in the economy. Both these policies are complementary and support each other. Monetary policy taken alone may not be effective to regulate the economy, say controlling inflationary or deflationary situations. That is why monetary policy these days in well-developed money markets is implemented along with fiscal and debt management policies".

Manufacturing involves the conversion of raw materials into finished consumer goods or intermediate or producer goods. According to Adofu, Taiga &Tijani (2015), "manufacturing is viewed as the production of merchandise for sale or use through the application of tools, machine, labour, chemical and biological formulation. It involves both handicraft of human activities and high tech through which raw materials are transformed or converted into finished product in large scale. Manufacturing like other industrial activities creates avenue for employment, helps to boost agriculture, diversify the economy and increase a nation's foreign exchange. It also minimizes the risk of over dependence on foreign trade and leads to full utilization of available resources". Manufacturing sector development therefore refers to the application of modern technology, equipment's and machineries for the production of goods and services, alleviating human suffering and to ensure continuous improvement in their welfare. Modern manufacturing processes are characterized by high technological innovations, development of managerial and entrepreneurial talents and improvement in technical skills which normally promote productivity and better living conditions, and these are usually capital intensive and requires macroeconomic policy attention.

Historically, no country of the world ever experience economic growth and development without having a robust manufacturing sector. Manufacturing is the core mover of industrialization and it plays a key role in the global economy. 'The emergence of modern manufacturing had led to the dramatic changes in the structure of the world economy and to sustained increases in the growth of labour productivity and economic welfare' (Maddison, 2007). Manufacturing plays a unique role because it has strong linkages with all other sectors of the economy and is the fundamental base for the economic health and security of a nation.

In Nigeria all the monetary policy variables have being misbehaving over a period of time, and this has been affecting manufacturing sector's productivity negatively. Inflation has remained persistently at high double digits together with constantly depreciating exchange rate. 'Inflation rate in Nigeria hits 23.35% in July 2023' (NBS, 2023), and later soared to '33.69% at as April 30, 2024' (NBS, 2024). The exchange rates of naira hover above ₦1000 to one US dollar since 2024, and as at May, 2024 it was one US Dollar to ₦1471. As hyperinflation scale up the cost of production, the same is applicable to high exchange rate**,** since the instability in the exchange rate affects the output production of manufacturing industries as a result of the fact that most of the manufacturing industries in Nigeria largely depended on imported raw materials for the production of their output.

The CBN monetary policy rate (MPR) hits '18.75% on July 24-25, 2023 Monetary Policy Committee (MPC) meetings from about 13% in July, 2022, but inflation increased from 22.79% in June, 2023 to 23.35% in just a month after' (NBS, 2023), and when the MPR was further increased to 22.75 just six months after, instead of taming the inflation, the inflation rate skyrocketed to 33.69% in April 2024 (NBS, 2024), a seemingly disconnect between CBN policy rate and the market rate. Presently in Nigeria, interest rate charged by the deposit money banks to the private businesses is hovering between 25% and 30% and even more. Ekpo (2014), "the real sector of the economy in Africa is dead, as the lending rate hover around 25 percent. Thus, the central banks need to address the issue of investment climate as well as the issue of the welfare of the citizens, vis-a-vis the economic and demographic settings as well as the foundation that was laid for economic reform in the various countries. The high lending rate does not favor the real sector, and this may be responsible for the paradox of Africa's economy: Growth without development; disparity between economic growth and standard of living of the people etc". For instance, Manuaka (2014) opined that "foreigners are taking over Nigeria's agricultural sector, and the reason being that of excessive interest rate being demanded by the Nigeria's deposit money banks, as these banks demand up to 25-30 percent interest rate. In comparison, India demands between 3 to 4% agro loans, while for Europe, it lies between 2 and 3 %. The only way you can compete with others is for you to have cheap funds that will reduce your cost of production. Denmark with population of about five million and less land mass than Nigeria has a net agro-export worth over 80 billion Euros". Consequently, Adesina (2017) reported "that Africa spends far too much on food imports approximately US S35 billion in 2016. Left unchecked, the figure is expected to surge to US ***S***110 by 2025". In Nigeria, Udi (2024) reported that 'the value of agricultural goods imported into Nigeria in 2023exceeded exports byN1,037 trillion marking the fifth consecutive year Nigeria imports exceed exports'. Data gleaned from the NBS (2024) 'foreign trade report for 2023 revealed that

Nigeria imported agricultural goods worth N2,281 trillion in 2023 and exported agro-produce valued at valued at N1,244 trillion in the year under review'.

More worrisome is that the deposit money banks in Nigeria don't normally lend to the real sectors of the economy, but always prefer to lend to the government and other lower risks businesses like oil importation. 'In Nigeria, about 40 percent of Small and Medium Enterprises are owned by women, but many of them are relying on families and allied for their finances' (MAN, 2023). Also problematic is that the public sector in Nigeria received the bulk of the CBN and commercial banks loans and advances, thereby crowding out private investments. For instance, 'out of about Nigeria's 77 trillion naira debt, about N22.57 trillion as at December 2022 was sourced domestically; while Nigeria budgeted a total of N21.83 trillion for 2023 with a deficit of N11.4 trillion, out of which about N6.3 trillion naira representing 29% was for debt servicing, while about 74% of loan given so far to government by CBN was to fund budget deficit' (Onwudinjo, 2024)..

In Nigeria, the manufacturing sector had over the years been characterized by low productivity in output production, while and the sector's contribution to the nation's Gross Domestic Product (GDP) has been relatively low over the years. According to Giwa (2013), 'the low output production and the low contribution of the sector to the GDP was largely due to the inconsistency in monetary policies variables such as lending rate, broad money supply, cash reserve ratio added with high volatility of exchange rate'. "Consequently, the contributions of manufacturing sector to Nigerian GDP in the fourth quarter of 2023 dropped from 8.40% as was recorded in the corresponding period of the previous year, to 8.23%. It was 10.4% about 40 years ago in 1980. Nigeria's manufacturing output for 2022 was $64.25 billion, a 0.25% decline from the previous year. Thus, the growth of the manufacturing sector in Nigeria has been weak and sluggish since its recovery from Covid-19 pandemic with Annual Growth of 3.45 in 2021 and 2.5% in 2022, culminating in the sector's contributions to the GDP falling far short of globally competitive levels of average of 10%" (Udi, 2024).

It therefore, becomes necessary to highlight the monetary policy in Nigeria and examine the extent to which it has actually impacted to the growth of the manufacturing sectors' output in the economy. Thus, this study aims to ascertain the effect of monetary policy on manufacturing sectors' output in Nigeria.

2.0 MONETARY POLICY THEORIES.

Money according to the classical economists is a veil. It is neutral in its effects on the economy, and simply affects the price level. An increase in the money supply leads to an increase in price level but the real income, the rate of interest and the level of real economic activity remain unaffected. The relationship between money and the price level is explained in terms of the quantity theory of money. "The classical quantity theory of money states that the price level is a function of the supply of money. Algebraically, MV=PT, where M,V, P and T are the supply of money, velocity of money, price level and the volume of transactions (or real output)respectively. The equation tells us that the total money supply MV equals the total value of output PT in the economy" (Jhingan, 2007).

In the Keynesian analysis, monetary policy lays a crucial role in affecting economic activity. It contends that a change in the supply of money can permanently change such variables as the rate of interest, the aggregate demand and the level of employment, output and income. Keynes (1936) believed in the existence of unemployment equilibrium. 'This implies that an income in money supply can bring about permanent increases in the level of output. This rise in supply of money, its first effect is on the rate of interest which tends to fall. Given them marginal efficiency of capital, a fall in the rate of interest will increase investment. The increased investment will raise effective demand through the multiplier effect thereby increasing income, output and employment'. For Keynes, "the rate of interest is determined by the demand for and supply of money. If either the demand for money or the supply of money changes the equilibrium rate of interest would change. The supply of money is determined by the monetary authority which is normally fixed in the short-run. In other words, the money supply curve is perfectly inelastic. Thus, the demand for money is the desire to hold cash for transaction, precautionary and speculative purposes. The speculative demand for money depends upon the rate of interest or bond prices".

3.0 EMPIRICAL LITERATURE

In order to appreciate the impact of monetary policy on manufacturing sectors' output in Nigeria, it will be pertinent to review some empirical views of researchers on this monetary policy influence. Okonkwo, Egbulonu and Emerenini (2015) employed the cointegration technique to investigate the effect of monetary policy variables on the manufacturing sector in Nigeria from 1981 to 2012. The findings indicated that 'money supply and credit to private sector have significant positive effects on the manufacturing sector in Nigeria'. Igbinedion and Ogbeide (2016) employed the error-

correction approach to examine the relationship between monetary policy and manufacturing capacity utilization in Nigeria within a period covering 1980 and 2014. The results revealed that 'monetary policy variables significantly explained about 81% of variables in manufacturing sector performance'.

Using a time series covering 1970 to 2010, Owolabi and Adegbite (2014) investigated the effect of monetary policy on the growth of Nigerian industry. "The multiple regression technique was adopted to regress monetary policy tools including Treasury Bills, Deposit & leading and Rediscount Rate on manufacturing output. It was found that monetary policy tools had 81.56% significant explanatory powers in determining industrial growth in Nigeria. Further findings revealed that rediscount rate and deposit rate have a significant positive effect on industrial output while Treasury Bills had a negative impact on industrial output".

Omini, Ogbeba and Okoi (2017) employed the VAR (VECM) model and Granger causality test to investigate the impact of monetary policy shocks on industrial output in Nigeria between 1970 and 2015. Findings revealed that the "manufacturing sub-sector had a positive influence on monetary policy rate, commercial bank credit to industrial sector and exchange rates, while contribution of solid minerals sub-sector to GDP responded positively to shocks in commercial bank credit to the industrial sector and exchange rate after the first year. The causality test indicated a unidirectional relationship running from monetary policy rate and exchange rate to the contribution of manufacturing sector to GDP on the one hand, and commercial bank credit to the industrial sector and exchange rate to the contribution of solid mineral sector to GDP".

Imoughele and Ismaila (2014) carried out a study to find out the impact of monetary policy on manufacturing sector performance in Nigeria for the period covering 1986 to 2012. The study employed external reserve, exchange rate, inflation rate, broad money supply and interest rate as the independent variables of monetary policy and manufacturing gross domestic product as the dependent variable. Findings from Johansson cointegration and VAR model revealed that "external reserve, exchange rate and inflation rate were statistically significant to manufacturing sector output while broad money supply and interest rate were not statistically significant to manufacturing sector output in the previous and current year. However, interest rate, exchange rate and external reserve impacted negatively on the sector output but broad money supply and inflation rate affect the sector positively".

Charles-Anyaogu (2012) examined the performance of monetary policy on the manufacturing index performance in Nigeria between 1980 and 2009. The study employed granger causality to test for impact, while VEC and OLS were used to examine the significance, magnitude, direction and relationship of some macroeconomic variables (lending rate, income tax rate, money supply, Inflation rate, and Exchange rate) on the Manufacturing index in Nigeria. The results showed that Money Supply positively affect manufacturing sector performance by 0.5% while others played negative impact to the performance of the manufacturing sector over the years.

From the empirical literature reviewed in this study, the researcher observed that much work have not been carried out on the impact of monetary policy on foreign direct investment in Nigeria, but only on the individual monetary policy variables such as interest rate, exchange and on growth'.

4.0 METHODOLOGY

The ordinary least square (OLS) technique is employed in obtaining the numerical estimates of the coefficient parameters, the OLS is chosen because of its BLUE (best linear unbiased estimator) properties, according to Gujarati (2009) "OLS method have some very attractive statistical properties that have made it one of the best and most powerful method of regression. It is intuitively appealing and mathematically much simpler than any other econometric techniques". E view 9 regression software package is employed in this analysis to test non violation of the basic assumption of the OLS model.

4.1 Model Specification

The functional form of the model is specified as follows.

$$MGDP = f(M2, INTR, CRR) \quad (1)$$

The mathematical form of the model is stated thus:

$$MGDP = \beta_o + \beta_1 M_{2t} + \beta_2 INTR_t + \beta 3 CRRt \quad (2)$$

The econometric form of the model is also as follows:

$$MGDP = \beta_o + \beta_1 M_{2t} + \beta_2 INTR_t + \beta_3 CRR_t + \mu_t \quad (3)$$

Where:

MGDP= Manufacturing sectors' output
f = functional relationship
M_2= Broad Money supply
INTR = Interest Rate
CRR = Cash reserve ratio
β_o = Benchmark (RGDP Intercept)
β_1, β_2 and β_3 = Slope coefficient
μ_t= Error term
t = time from 1981-2017

The Granger causality test is used to test the causal relation among the dependent and independent variables. The granger causality test is based on Engle and Granger (1987) pairwise granger causality test.

MGDP= $\varphi_0 + \sum_{i-1}^{n} \varphi_1 INTR\ t-i + \sum_{i-1}^{n} \varphi_2\ M2Q_{t-i} + \sum_{i-1}^{n} \varphi_3\ CRR_{t-i} + +\mu_{1t}$ (4)

INTR= $B_O + \sum_{i-1}^{n} B_1\ INTRP_{t-i} + \sum_{i-1}^{n} B_2\ MGDP + \sum_{i-1}^{n} B_3\ M2P_{t-i} + \sum_{i-1}^{n} B_4\ CRR_{t-i} + \mu_{1t}$ (5)

Decision rule.

Accept Ho if the F-Probability is high and reject Ho if it is low. i.e if f-Probability is < 0.05.

1. If one granger causes-Unidirectional causation
2. If both granger cause each other-Bi-directional causation

If there exist a long run relationship (co-integration) among the time series variables, the Vector Error correction mechanism will be estimated to know the rate at which the dependent variable returns to equilibrium to the independent variable after some levels of variations i.e to derive the numerical value of the magnitude of the short run dynamics or disequilibrium. The model is as below,

$\Delta Y_t = b_0 + b_1\Delta X_t + b_2\Delta X_{t-1} + \mu_t$ (6)

Decision Rule

In conducting VECM, the expected sign of the result should be negative. A positive VECM implies a model misspecification or an indication of structural changes and will not give us the rate of these change in the dependent and independent variables.

4.2 Sources of Data

Secondary data are used for this study and they include the aggregate annual time series on real interest rate (INTR), Manufacturing sector output (MGDP), broad money supply (M2), and Cash reserve ratio covering the period 1981-2017. This results in 37 pairs of observations. The unit of measurement for the variables is the Naira. The data was extracted from the Central Bank of Nigeria Statistical Bulletin 2017 edition.

5.0 DISCUSSIONS OF RESULTS

This chapter presents the regression results and interprets the various economic, statistical and econometric tests in study. The hypotheses posed in the work are also examined based on the empirical results.

Unit Root Test.

The result of the Augmented Dickey-Fuller (ADF) Unit Root Test to check the stationarity of the variables in the model is presented in table 5.1 below.

Table 5.1: Result of Unit Root Test

Augmented Dickey Fuller Unit Root Test				
Variables	ADF Test Statistic	t-statistic 5% Level	Order of Integration	Test Result
LNMGDP	-5.690778	-2.948404	I(1)	Stationary at 1st difference
LNCINTR	-3.526526	-2.945842	I(0)	Stationary at Level
LNCRR	-4.645636	-2.948404	I(1)	Stationary at 1st difference
LNM2	-6.738171	-2.948404	I(1)	Stationary at 1st difference

Source: Author's Computation, 2019.

The result showed that manufacturing sector output (MGDP), cash reserve ratio (CRR), and broad money supply (M2} are stationary at first difference while interest rate (INTR) is stationary at level. The test was conducted on the basis of the following hypothesis:

'H_O**:** Variable contains unit root and therefore is non-stationary, while H_1: Variable does not contain unit root and hence is stationary. Since all the variables are not stationary at level, a co integration test was conducted to find out if the variables have a long run relationship, that is, whether or not the variables are co integrated'.

Co-integration Test Result

The co-integration test was carried out using the Johansen co-integration test and under the Johansen co-integration test, co-integration is said to exist if the values of the computed Eigen values are significantly different from zero or if the trace statistics is greater than the critical values at 5% level of significance.

The result of the co-integration test indicated no co-integration equation. This is because the trace statistics is less than the critical values at 5% level of significance in all of the hypothesized equations. Similarly, the computed Eigen value is not significantly different from zero in all of the hypothesized equations. Hence, none of the hypothesized equations satisfies this condition and therefore, the null hypothesis of no co-integration among the variables is not rejected in all the equation.

Table 5.2: T-test

Variable	**t-value**	**t-tabulated**	**Decision**	**Conclusion**
INTR	-0.010461	2	Do not reject H_0	Statistically insignificant
M2	-4.04970	2	reject Ho	Statistically significant
CRR	-0.14010	2	Do not Reject H_0	Statistically insignificant

Source: Author's Computation, 2019.

From the T-test table above, it is clear that the impact of Interest rate and cash reserve ratio on manufacturing sectors' output are not statistically significant. While broad money supply has negative but significant impact on the output of the manufacturing sector in Nigeria for the same period under study.

Presentation and Interpretation of Results

Having satisfied the condition for long run equilibrium relationship as was revealed by Johansen co-integration which indicated no co-integrating equations, the next step is to construct a Vector auto regression (VAR) so as to estimate the short run relationship that exists among the specified variables and equally the speed of adjustment having lost information about long run relationship through differencing. The VAR result is presented in table below.

Vector Autoregression Estimates
Date: 12/26/19 Time: 01:58
Sample (adjusted): 1982 2017
Included observations: 36 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LNMGDP	LNINTR	LNM2	LNCRR
LNMGDP(-1)	0.822208	-0.010461	-0.282842	-0.018697
	(0.25274)	(0.05408)	(0.06984)	(0.13345)
	[3.25314]	[-0.19342]	[-4.04970]	[-0.14010]
LNINTR(-1)	0.700481	0.467402	0.560211	0.047775
	(0.77005)	(0.16478)	(0.21280)	(0.40660)
	[0.90965]	[2.83650]	[2.63262]	[0.11750]
LNM2(-1)	-0.085525	0.053175	1.123691	0.218878
	(0.30263)	(0.06476)	(0.08363)	(0.15979)
	[-0.28260]	[0.82111]	[13.4366]	[1.36974]
LNCRR(-1)	0.172781	-0.062092	0.072109	0.696964
	(0.25653)	(0.05489)	(0.07089)	(0.13545)
	[0.67353]	[-1.13113]	[1.01722]	[5.14550]
C	-0.997151	1.510820	-0.657223	-0.196532
	(2.15781)	(0.46174)	(0.59629)	(1.13936)
	[-0.46211]	[3.27200]	[-1.10219]	[-0.17249]
R-squared	0.777467	0.482362	0.988540	0.911661
Adj. R-squared	0.748753	0.415570	0.987061	0.900263
Sum sq. resids	27.98852	1.281602	2.137298	7.803238
S.E. equation	0.950187	0.203327	0.262574	0.501714
F-statistic	27.07626	7.221855	668.4956	79.98032
Log likelihood	-46.55075	8.955562	-0.250210	-23.56014
Akaike AIC	2.863930	-0.219753	0.291678	1.586675
Schwarz SC	3.083864	0.000180	0.511612	1.806608
Mean dependent	6.118581	2.868716	5.976046	3.515042
S.D. dependent	1.895652	0.265968	2.308341	1.588647

Determinant resid covariance (dof adj.)	0.000112
Determinant resid covariance	6.15E-05
Log likelihood	-29.79425
Akaike information criterion	2.766347
Schwarz criterion	3.646080

Evaluation Based On Economic (A Prior) Criteria.
From the VAR result above, shows that about -0.997151 is the level of the amount of manufacturing sectors'

output (MGDP) at the present period that does not depend on the lag value of MGDP and other explanatory variables. That is, it is the present value of the output of the manufacturing sector when its lag value and other explanatory variables are at zero level.
Manufacturing Sectors' output lag(-1)
The coefficients of MGDP (-1) is 0.822208 units. This result implies that when there is a unit rise in output of the manufacturing sector (MGDP) lagged for a year, it will on the average bring about an Increase in MGDP of the current period by 0.822208 units holding other variables constant i.e. a positive relationship between them, and it is statistically significant over the period covered.
Interest Rate (INTR)
The VAR result indicates that the coefficient of interest rate (INTR) is -0.010461 units. This result implies that if the monetary authority through the commercial banks increases the cost of borrowing money (i.e interest rate) by a unit, it will on the average brings about decrease in the output of the manufacturing sectors by 0.010461 units. This result is in line with the theoretical underpinnings, but not statistically significant for the period covered.
Broad Money Supply (M2)
The coefficient of broad money supply (M2) is estimated to be -0.282842 units, this entails that when there is effective increase in the volume of money in circulation, it will result to decrease in the output of the manufacturing sector by 0.282842 units. That is, there is inverse or negative relationship between the broad money supply and manufacturing sectors output in Nigeria. The result is statistically significant under the period covered.
Cash Reserve Ratio (CRR)
The VAR result also indicated that the coefficient of cash reserve ratio (CRR) is -0.018697 units. Which simply implies that as cash reserve ratio rises by one unit, the manufacturing sectors' output (GDP), will decreased by 0.018697 units. That is, there is a negative insignificant relationship between them.
Evaluation of Research Hypotheses
The results from the statistical tests conducted (especially the F-stat tests), indicates that the overall result are significant in explaining variations in the dependent variables. Hence, inferences and conclusions drawn from the model are both sound empirically reliable for policy making. This research work is based on the following hypothesis:

Ho_1: Monetary policy has no significant impact on manufacturing sectors' output in Nigeria
Ho_2: There is no significant causality relationship between monetary policy and
Manufacturing sectors' output in Nigeria
The result of t-test indicates that some monetary policy variables such as interest rate (INTR) and cash reserve ratio do not impact significantly on manufacturing sectors' output in Nigeria for the period covered. While variable such as broad money supply has significant impact on manufacturing sectors' output for the same period under study.
Therefore the hypothesis that monetary policy has no significant impact on manufacturing sectors' output in Nigeria is not rejected since out of the three monetary policy variables indicator, only one (broad money supply) impacted significantly on manufacturing sectors' output.

6.0 CONCLUSION

In conclusion, empirical evidence has shown that monetary policy does not impact significantly on manufacturing sectors' output in Nigeria over the study period and this is as a result of inefficient and ineffective policies taken by the monetary authority over the years. 'The result of the Engle-Granger Pairwise Granger causality test used to test the hypothesis that there is no significant causality relationship between monetary policy and manufacturing sectors output in Nigeria' showed that there is no significant directional causality relationship between manufacturing sectors' output and monetary policy variable indicators (interest rate, broad money supply and cash reserve ratio) in Nigeria for the period under study'.
From the study, the result indicated that interest rate, and cash reserve ratio have negative insignificant impact on manufacturing sectors' output in Nigeria, while broad money supply has negative significant impact on output of the manufacturing sectors in Nigeria for the same period under study. 'Coefficient of multiple determinations (Adj. R^2) value of 0.748753 (approximately 75%) implies that the estimated (short run) model has a good fit and strong explanatory power and shows that about 75% of the total variation in manufacturing sectors output (MGDP) is explained by the independent variables in the model, while the remaining 25% is accounted by the error term. F-statistic value of 27.07626 showed that explanatory power of the model is statistically significant at 5 percent level of significance as indicated by prob (F-statistic) 0.0000 of the model. This indicates that the independent variables exert joint influence on the dependent variable'.
'The result also indicated that interest rate has negative insignificant relationship with manufacturing sectors

output in Nigeria. This economically implies that, if the monetary authority, through the commercial banks, increase the interest rate (cost of borrowing fund) in Nigeria, it will discourage the manufacturers not to borrow more money from the commercial banks, which will in turn decrease their productivity in Nigeria, thereby causing the gross domestic product to reduce. Broad money supply impacted negatively on manufacturing sectors output but statistically significant over the period studied. This implies that, when monetary authority increases the volume of money supply in the economy, it will result to decrease in the output of the manufacturing sector in Nigeria'.

'The impact of cash reserve ratio is negative and statistically insignificant over the period covered. This result implies that when there is increase in cash reserve ratio of the commercial banks, it will result to decrease in the output of the manufacturing sectors in Nigeria. The result of the Engle-Granger Pairwise Granger causality test showed that there is significant -directional causality relationship between monetary policy variable indicators and manufacturing sectors output in Nigeria over the period studied'.

Based on the above findings, it is recommended that; the monetary authority should target a single-digit interest rate in order to encourage manufacturing sector in Nigeria. Interest rate of more than one digit could be counter-productive and discourage investment; again, since money supply was seen to have negative effects on the manufacturing sector output, the study recommended that the monetary authority (CBN) should employ a contraction monetary policy that can decrease money supply to the real sectors and boost output performance of the manufacturing sector in the Nigerian economy. Finally, monetary authority should stop financing the government budgets through the banking system. This has become necessary as such practice put pressure on bank reserves and deposit which result to financial repression and subsequently hiking the real interest rate which will eventually crowd out private investment and businesses. These recommendations will position the manufacturing sector in Nigerian to competitively participate in African Continental Free Trade Agreement.

REFERENCES

Abeng, E.(2016) The relative effectiveness of fiscal and monetary policy in macroeconomic management in Nigeria. *The African Economic and Business Review, 3(1):* 23-40.

Adelegan, O.J. (2011), Infrastructure deficiencies and investment in manufacturing firms in Nigeria. *Journal of Economics and International Finance, 3(9), 542-552.*

Adeolu A.M, Kehinde, J. S,& Bolarinwa, S. A. (2012). Fiscal/monetary policy and economic growth in Nigeria: A theoretical exploration. *International Journal of Academic Research in Economics and Management Sciences, 1(5)*: ISSN: 2226-3624

Adigwe, P. K., Echekoba F.N., & Justus B.C.O.(2015). monetary policy and economic growth in Nigeria: A Critical Evaluation, *IOSR Journal of Business and Management* (IOSR-JBM), 17(2): 12-20

Adofu, I., Taiga, U., & Tijani, Y. (2015) Manufacturing sector and economic growth in Nigeria. *Donnish Journal of Economics and International Finance, 1(1), 1-6.*

Akujuobi C. (2010): Analysis of the impact of monetary policy on economic performance in Nigeria. *Pakistan Journal of Social Sciences 2(8)*

Anyanwu, J. C. (1993). *Monetary Economics: Theory, Policy and Institutions.* Onitsha: Hybrid Publishers.

Asiedu, E.,& Lien, F. (2004) An appraisal of monetary policy and its effect on macroeconomic stabilization in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences, 2(3),* 232-237.

Bakare, T. A. & Osobase, A. O. (2015). Effect of Fiscal and Monetary Policies on Industrial Sector Performance- Evidence from Nigeria. *Journal of Economics and Sustainable Development, 6(17),* 61 – 81.

Busse, F., &. khattty, E, (2010). An empirical study of the determinant of money supply growth and its effect in inflation rate in Nigeria. *Journal of Research in International Business and Management*. 1(5):124-129.

Charles, A. N. B. (2012) Investigating the performance of monetary policy on manufacturing sector in Nigeria. *Arabian Journal of Business and Management Review, 2(1),* 12-25.

Cheng, N. G. (2012) Concept of money and monetary policy bullion. *Journal of Kenya economic*. 7(2).

Chuku, C. A. (2009). Measuring the effects of monetary policy innovations in Nigeria, *African Journal of Accounting, Economics, Finance and Banking Research.* 5(5):141-153

C.B.N (1992) Monetary Policy Department: http://www.cenbank.org.1 Central Bank of Nigeria Statistical Bulletin for several issues: http://www.cenbank.org/

C.B.N (2023) Monetary Policy Department: http://www.cenbank.org. Central Bank of Nigeria Statistical Bulletin for several issues: http://www.cenbank.org/

C.B.N (2024) Monetary Policy Department: http://www.cenbank.org. Central Bank of Nigeria

Statistical Bulletin for several issues: http://www.cenbank.org/

Ezeaku, H. C., Ibe, I. G., Ugwuanyi, U. B., Modebe, N. J. & Agbaeze, E. K. (2018). Monetary policy transmission and industrial sector growth: Empirical evidence from Nigeria. *SAGE Open, April-June*, 1–12.

Fasanya, I.O. & Onakoya, A.B.O. (2013). Does Monetary Policy Influence Economic Growth in Nigeria? *Asian Economic and Financial Review, 3, 635-646.*

Folawewo, A.O. and Osinubi, T.S. (2006). Monetary Policy and Macroeconomic Instability in Nigeria: A Rational Expectation Approach. *Journal of Social Sciences, 12, 93-100.*

Giwa, R.R.F.(1996).Thought on the Nigeria economy, Nigeria financial review, vol3, No4.

Gujarati, N. (2009) Basic econometrics, 5th Edition. Mc Graw-Hill inc Singapore.

Hameed, G, Khalid, M., & Sabit, R. (2012) Linkage between Monetary Instruments and Economic Growth. *Universal Journal of Management and Social Sciences, 2(5)*

Igbinedion, S. O., & Ogbeide, F. (2016). Monetary policy and manufacturing capacity utilization: Further evidence from Nigeria. *South-Eastern Europe Journal of Economics, 2*, 159–174.

Imoughele, L. E. & Ismaila, M. (2015) Monetary Policy and Balance of Payments Stability in Nigeria. *International Journal of Academic Research in Public Policy and Governance, 2(1),* 1 – 14.

Jekumber, R. & Mustapha A. (1998) The economic effect of exchange rate in Nigeria, what monetary authority should do? *Journal of Science and Technology Education Research* vol.1(4),pp.85-91.

Maddison,E. (2001) The Performance of Nigeria manufacturing firms: Report on the Nigerian manufacturing enterprise survey. *United Nations Industrial Development Organization, Centre for the Study of African Economic, Department of Economics, University of Oxford pps 2-3*

Madueme, S.F.(2010,2011): Fundamental rules in social science research methodology. Enugu: Jolyn publisher, Nsukka.

National Bureau of Statistics (2023) Annual Publications of the National Bureau of Statistics, Abuja.

National Bureau of Statistics (2024) Annual Publications of the National Bureau of Statistics, Abuja.

Nwede, E. E. (2010). *Managing multinationals for National Development: An unpublished paper presented at NASMET: (Nigeria Association of School of Management Education in Training).*

Nwankwo A. (2012) *The determinants of foreign direct investment inflows (FDI) in Nigeria. 6th Global Conference on Business and Economics.*

Okonkwo, O. N., Egbulonu, K. G. & Emerenini, F. M. (2015). Monetary policy and the manufacturing sector in Nigeria. *SSRG International Journal of Economics and Management Studies, 2(1),* 11 – 19.

Omini, E. E, Ogbeba, E.P, & Okoi, O. (2017). Monetary policy shocks and industrial output in Nigeria. *British Journal of Economics, Management & Trade Article no. BJT.30459, 16* (2), 1–13.

Onakoya, A. B., Ogundajo, G. O. & Babatunde, S. J. (2017) Monetary policy and the sustainability of the manufacturing sector in Nigeria. *Review of Innovation and Competitiveness, 3(4),* 71 – 88.

Onwudinjo L.E (2024) 'Central Banking in African Democracy', Enugu; Sir Pee Digital Press & Services Ltd

Onyeiwu, C., (2012) Monetary policy and economic growth of Nigeria. *Journal of Economics and Sustainable Development*, 3(7): 62 -70.

Olorunfemi, S. & Dotun, F. (2008) Stationarity analysis of the impact of monetary policy on economic performance in Nigeria. *Pakistan Journal of Social Sciences 5(6), 562-566.*

Owolabi, A. U & Adegbite, T. A. (2014). Impact of monetary policy on industrial growth in Nigeria.*International Journal of Academic Research in Business and Social Sciences, 4(1),* 18 – 31.

Salvin, M. S. (2013). An empirical analysis of the demand for money in Nigerian economy (1960-1986); M sc. *Research project, presented to the Department of Economics, Ahmadu Bello University, Zaria,*

Udi A (2024) 'Contributions of Manufacturing Sector to Nigeria GDP Declines to 8.23%. *In Nairametrics.* Https://nairametrics.com. Accessed on 26/02/2024.

Udude C. C. (2014). Monetary policy and economic growth of Nigeria (1981-2012), *Journal of Policy and Development Studies.* 9(1)

Udoh,S.A.,& Udeaja, F.A.(2011); Measuring the impact of manufacturing sector in Africa; A factor augmented vector autoregreesive(favar) approach the quarterly economics.120 (1): 287-422.

Ugwuanyi, W. (2013) The Nigerian Financial System: *A Systematic Approach*, 4th edition, Aguda, Lagos: Johnkens & Willy Nig. Ltd.

APPENDIX 1
PRESENTATION OF DATA

YEAR	M2	INTR	CRR	MGDP
1981	9.9153	7.75	36.42	26.89
1982	10.2918	10.25	16.0637	29.09
1983	11.5178	10	7.12287	31.13
1984	12.4971	12.5	9.41396	27.12
1985	13.878	9.25	10.1411	37.14
1986	13.5604	10.5	6.07633	38.65
1987	15.1957	17.5	5.16051	43.22
1988	22.2321	16.5	3.14943	63.52
1989	26.2688	26.8	6.77604	72.9
1990	39.1562	25.5	12.34	84.27
1991	50.0717	20.01	13.953	110.6
1992	75.9703	29.8	4.12167	153.47
1993	118.753	18.32	5.34359	221.23
1994	169.392	21	4.98356	354.66
1995	201.415	20.18	5.01288	414.13
1996	227.464	19.74	13.7814	477.95
1997	268.623	13.54	27.3338	546.71
1998	318.576	18.29	24.0767	620.2
1999	393.079	21.32	19.4178	713.82
2000	637.731	17.98	31.1961	826.03
2001	816.708	18.29	33.8867	989.11
2002	946.253	24.85	23.8099	1127.23
2003	1225.56	20.71	20.1982	1304.07
2004	1330.66	19.18	43.2515	1516.05
2005	1725.4	17.95	111.172	1778.73
2006	2280.65	17.26	444.357	2082.49
2007	3116.27	16.94	427.411	2401.19
2008	4857.31	15.14	408.254	2761.55
2009	5017.12	18.99	285.47	3170.82
2010	5571.27	17.59	231.752	3578.64
2011	6771.58	16.02	205.305	4527.45
2012	7420.95	16.79	262.303	5588.82
2013	6801.08	16.72	218.764	7233.32
2014	7246.6	22.79	151.468	8685.43
2015	7060.05	18.77	107.941	8973.77
2016	1772.94	18.768	185.119	38.65
2017	5720.17	19.262	165.823	43.22

Source: Central Bank of Niigeria Statistical Bulletin, 2017 Edition

APPENDIX 2
STATIONARITY TEST
LNMGDP

Null Hypothesis: D(LNMGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.690778	0.0000
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

R-squared	0.495297	Mean dependent var	0.000946
Adjusted R-squared	0.480003	S.D. dependent var	1.345830
S.E. of regression	0.970489	Akaike info criterion	2.833412
Sum squared resid	31.08102	Schwarz criterion	2.922289
Log likelihood	-47.58471	Hannan-Quinn criter.	2.864092
F-statistic	32.38495	Durbin-Watson stat	1.999396
Prob(F-statistic)	0.000002		

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNMGDP,2)
Method: Least Squares
Date: 12/26/19 Time: 00:59
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNMGDP(-1))	-0.990683	0.174086	-5.690778	0.0000
C	0.011215	0.164053	0.068363	0.9459

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

WOMEN ENTREPRENEURS IN THE DIGITAL ERA: AN EMPIRICAL ANALYSIS OF SELECTED WOMEN ENTREPRENEURS IN KANO STATE

Aisha Aminu
Department of Business Administration and Entrepreneurship, Bayero University, Kano
Corresponding author:
aaminu.bus@buk.edu.ng ; ayshaaminu25@gmail.com

ABSTRACT
Globally, entrepreneurship fosters any nation's social and economic advancement and has a favourable correlation with wealth. In Northern Nigeria, women's roles are customarily limited to the familydomestic duties and obligations. Due to urbanization, technological advancement, industrialization, and education, women are realizing the need to earn money to uplift society and families as their male counterparts, therefore, women are deviating from the traditional stereotype and joining the workforce.. This is why, in the vibrance of entrepreneurship, the emergence of women entrepreneurs need a new direction, especiallyfor women in isolated areas due to cultural and religious factors. As a result, this study considers the potential effect of women entrepreneurs in the digital era with reference to those in Kano State. The study was anchored on entrepreneurship theory and social constructivism theory. The study used a cross-sectional analysis and data collection from the community using questionnaire approaches. The population of the study consists of women entrepreneurs in Kano State, Nigeria. A censor population of 368 sample respondentswere used in the analysis of this study. The summary of this regression outcome about the coefficient of remote work and digital online marketplace significantly influenced women's entrepreneurial intention through poverty reduction. This study discovered that as remote work continues to gain traction, it offers newfound flexibility and opportunities for women to pursue entrepreneurial ventures. The Government should implement gender-sensitive policies that promote equal access to resources,which will open collaborative avenues to provide targeted support programs, mentorship initiatives, and skill-building workshops tailored to women in entrepreneurship.

Keywords: *Women Entrepreneurs, Digital Era, Remote Work, Digitally online marketplace, Kano, Nigeria.*

1.0 INTRODUCTION
Entrepreneurship is a global concept that contributes to any country's social and economic development, establishing a positive relationship with economic prosperity. In northern Nigeria, traditionally, the role of women is only confined to the family, where women are responsible for all household chores and responsibilities (ref). Due to urbanization, technical up gradation, industrialisation, and education, women are moving from the traditional image into the working environment (ref). Women realize the need to earn money to uplift society and family. This is the reason why, in the vibrance of entrepreneurship, the emergence of women entrepreneurs need a new direction, especially for the women in isolated areas such as Kano due to cultural and religious factors. Despite this, women involved in various small and medium businesses (SMEs) are challenged to line up work in such a female-isolated society. Meanwhile, Anderson and Gerbing (2023) considered the rise of women entrepreneurs in the digital era as a testament to both their ingenuity and the transformative power of technology. This implies that, the advent of the digital age, women are no longer confined by traditional limitations, all barriers to entry have almost diminished, opening doors for women to carve out their paths in business, leveraging digital platforms, innovative technologies, and online communities to establish and grow their ventures with unprecedented ease and efficiency (Babin et al., 2021; Carter et al., 2021).

Previous studies have shown that the digital era has offered many opportunities to enterpreneurs to showcase their talents and ideas globally (Özbilgin & Woodward, 2016; Bertrand et al., 2021). These opportunities range from digital online marketplace, software development, and social media influence, which has provided a level playing field where creativity and determination reign supreme (Goyal & Parkash, 2023). By harnessing the power of these platforms, entrepreneurs can tap into a vast array of tools and resources to refine their skills, expand their networks, and navigate the complexities of running a successful business in the fast-paced digital age (Bertrand et al., 2021 Cardella et al., 2024). However, despite the vast potentials, women face unique challenges in leveraging digital tools to enhance their businesses, especially in isolated areas due to cultural and religious activities (Adejumo, 2021).

Kano State is located in Northern Nigeria and is renowned for its vibrant entrepreneurial ecosystem, yet women entrepreneurs in the region often encounter systemic barriers that impede their access to digital

resources and opportunities (Aliyu and Ambali, 2022). These challenges include limited access to technology and digital infrastructure, cultural norms, and gender biases that restrict women's participation in the digital economy, as well as inadequate training and support in utilizing digital tools effectively for business growth. As noted from the previous studies, there is a vacuum to fill with a specific reference to women entrepreneurs in Kano State. The present study explored the obstacles women entrepreneurs encounter in Kano State, Nigeria, as they navigate the digital landscapeand propose strategies for overcoming these barriers, expanding their businesses, and contributing to economic development. In order to achieve this aim, the following specific objectives are to:

a) Determine the resultant effect of remote work on women's entrepreneurial intention.
b) Examine the influence of online marketplace on women's entrepreneurial intention.

2.0 LITERATURE REVIEW

Concept of Women Entrepreneurs

The concept of women entrepreneurs encompasses women who initiate, organize, and manage businesses, taking on the risks associated with entrepreneurship, these women are breaking through traditional gender roles and barriers, demonstrating their capabilities in various industries, from technology to fashion and from healthcare to finance among others (DeSantis & Durante, 2016; Amine & Staub, 2019a). Capelleras and Greene (2022) argued that women entrepreneurs are individuals who establish and operate their businesses, taking on financial risks in pursuit of opportunities and managing businesses, often in diverse sectors ranging from technology, cosmetics, finance, fashion, healthcare, and education, among others. Indeed, one key aspect of women entrepreneurs is their ability to bring diverse perspectives and innovative solutions to the table (Welter & Brush, 2023). Research has shown that diverse teams, including those with gender diversity, tend to perform better and drive greater innovation (Acs & Audretsch, 2020). For example, women entrepreneurs often identify market gaps leading to developing products and services that cater to a broader audience. For this study, two major dimensions were adopted: remote work advocates and digital online marketplace.

Remote Work Advocates

The concept of remote work advocates in the passage of this study means the individuals or groups who champion the benefits and possibilities of working outside the traditional office environment (Zhang et al., 2019). This is because they believe that remote work offers numerous advantages, such as improved work-life balance, and reduced commuting stress (Zhang et al., 2019). Advocates often point to the potential for remote work to enhance productivity by allowing employees to create personalized workspaces tailored to their needs, free from the distractions and interruptions commonly found in office settings (Quinn et al., 2018). This was argued by Ratten and Tajeddini (2019) that remote work can lead to cost savings for both employees and employers, as it eliminates the need for expensive office space and can reduce overhead expenses associated with maintaining a physical workplace.

Digital Online Marketplace

The concept of a digital online marketplace encompasses a vast array of strategies and tactics aimed at promoting products or services using digital technologies (Quinn et al., 2018). At its core, it leverages the internet, mobile devices, social media platforms, search engines, and other digital channels to reach target audiences and drive desired actions. One of the key advantages of digital marketing is its ability to precisely target specific demographics, interests, and behaviors, allowing businesses to tailor their messages and offerings with unprecedented accuracy (Nelson & Nelson, 2022). Through techniques like search engine optimization (SEO), content marketing, email campaigns, social media advertising, and pay-per-click (PPC) advertising, companies can engage with consumers at various stages of the purchasing journey, from awareness and consideration to conversion and retention (Amine & Staub, 2019b; Nelson & Nelson, 2022).

Concept of Digital Era

The digital era represents a transformative period in human history characterized by the widespread adoption and integration of digital technologies into various aspects of society (Yitshaki & Kropp, 2018; Aliyu & Aminu, 2023). This era marks a shift from analog to digital formats across communication, entertainment, commerce, education, and virtually every other sector (Aliyu & Aminu, 2023). This transition has been fueled by the rapid advancement of computing power, the proliferation of the internet, and the development of sophisticated software and hardware technologies (Fang & Xiao, 2017). This information is not only stored and transmitted digitally but is also increasingly created and consumed in digital formats, fundamentally changing how individuals interact with data and each other (Aliyu & Aminu, 2023).

Valdez et al. (2022) reported one of the defining features of the digital era is the democratization of access to information and communication channels. This means that with the advent of the internet and digital devices, individuals across the globe now have unprecedented

access to vast amounts of information, resources, and opportunities. This accessibility has revolutionized education, allowing online learning platforms and open educational resources to reach learners in remote areas and underserved communities (Patton & Marlow, 2017). Aside, this has reshaped communication dynamics, enabling instant connectivity and collaboration across geographical boundaries through social media, email, video conferencing, and other digital platforms (Schumpeter & Shaver, 2020; Valdez et al., 2022).

Hypotheses Development

Obviously, previous studies have been documented on the digital era of women entrepreneurs (Patton & Marlow, 2017; Thompson & Smith-Hunter, 2021). However, a comprehensive examination of this phenomenon revealed many findings that underscore both the challenges and opportunities women face in the digital entrepreneurship realm. Firstly, access to resources emerges as a pivotal factor influencing the trajectory of women entrepreneurs (Lerner & Almor, 2020). While digital platforms offer unprecedented opportunities for global reach and scalability, disparities in access to funding, mentorship, and technical support persist, disproportionately affecting women-led ventures (Islam & Haque, 2024). This implied that addressing these gaps is imperative to unlock the full potential of women entrepreneurs and foster inclusive economic growth. Secondly, the digital era presents a paradoxical scenario of both empowerment and exacerbation of gender stereotypes, as Foss et al. (2021) reported. On the one hand, digital technologies democratize entrepreneurship by lowering barriers to entry and facilitating flexible work arrangements, thus enabling women to transcend traditional constraints (Foss et al., 2021). Conversely, Gartrell and Gartrell (2022) noted that pervasive gender biases permeate digital spaces, manifesting in discriminatory algorithms, online harassment, and unequal representation in tech leadership roles. Hence, navigating these digital landscapes requires a multifaceted approach encompassing policy reforms, organizational initiatives, and cultural shifts to promote gender equity and mitigate the impact of digital gender divides. Thus, the hypothesis is formulated:

H_{01}: There is no significant effect of remote work advocates on women's entrepreneurial intention

Furthermore, women entrepreneurs have been reported to be at the forefront of the paradigm shift, leveraging digital tools to disrupt traditional industries, pioneer new business models, and cultivate diverse communities of customers and collaborators (Jack & Anderson, 2018). This implies that embracing digital literacy and emerging technologies are indispensable strategies for women entrepreneurs to thrive in the digital economy. However, empowering women entrepreneurs is essential for economic growth and achieving gender equality and social progress. Women with equal opportunities to start and grow businesses contribute to poverty reduction, wealth creation, and community development (Madsen et al., 2021). This shows that governments, organizations, and institutions worldwide increasingly recognize the importance of supporting women entrepreneurs through policies, programs, and initiatives to address their specific challenges (Amine & Staub, 2019b). Effecting meaningful change requires concerted efforts from policymakers, industry stakeholders, and society to dismantle structural inequalities, cultivate inclusive entrepreneurial ecosystems, and harness the transformative potential of digital technologies to empower women entrepreneurs globally. Thus, the hypothesis is formulated:

H_{02}: There is no significant influence of digital online marketplace on women's entrepreneurial intention

Theoretical Framing

Entrepreneurship Theory

The entrepreneurship theory was developed by Joseph Schumpeter, as the engine of economic growth through innovation and creative destruction (Schumpeter, 1949). Schumpeter (1949) emphasized the role of entrepreneurs in disrupting existing markets and creating new ones by introducing new products, processes, and business models. Entrepreneurship theory provides insights into the entrepreneurial process, including opportunity recognition, resource acquisition, and venture creation (Katoch & Bukhari, 2021). More so, the theory seeks to understand the factors influencing entrepreneurial behavior, such as individual characteristics, environmental conditions, and institutional frameworks (Schumpeter, 1949). However, scholars like Sarasvathy (2008) contributed to developing theories that specifically address the entrepreneurial processes and strategies women adopt. The author believed there is increasing attention on the intersectionality of gender with other factors such as race, ethnicity, and class, highlighting the need for a more nuanced understanding of women's entrepreneurship within diverse socio-cultural contexts.

Social Construction Theory

Social constructivism theory, proposed by scholars like Jean Piaget (1964) and Lev Vygotsky (2018), suggests that individuals construct their understanding and knowledge of the world through social interactions and experiences (Vygotsky & Cole, 2018). This theory posits that reality is socially constructed through shared beliefs,

norms, and values within a particular cultural context. Social constructivism aims to explain how individuals make sense of the world around them and how their understanding is shaped by the society in which they live (Cardella et al., 2024). Unlike traditional cognitive theories that emphasize innate abilities, social constructivism highlights individuals' active role in shaping their learning and understanding. Meanwhile, in the context of women entrepreneurs, social constructivism offers valuable insights into how gender roles and societal expectations influence their entrepreneurial experiences (Vygotsky & Cole, 2018). Women often face unique challenges and barriers in entrepreneurship due to prevailing gender norms and stereotypes. Social constructivism underscores the importance of examining these social constructs and how they shape women's perceptions of their entrepreneurial capabilities and opportunities. For example, societal beliefs about women's roles as caregivers or their supposed lack of risk-taking behavior can impact their confidence in pursuing entrepreneurial ventures (Sarasvathy, 2008).

Thus, the entrepreneurship theory was not adequate to explain the circumstances surrounding women enterpreneurs' activities. In this case, social construction theory was used to explain how individuals make sense of the world around them and how their understanding is shaped by the society in which they live. Hence, the theory underpinning this study is an integration of the resultant effects of entrepreneurship and social construction theories.

Summary of Empirical Evidence

Table 1: Summary of empirical evidence

Author(s)	Study's Aim	Methodology	Findings	Bias Assessment
Katoch & Bukhari (2021)	The rise of digital entrepreneurship in developing markets	Quantitative of multiple case studies in two developing markets	Women social entrepreneurs are strongly inspired to address social problems, according to the findings	LLLL
Dhillon & Bhatia (2019)	The analysis of social constructivism approach and entrepreneurial activity of women entrepreneurs in the global business market	Secondary data namely GEM 2007 report on women and entrepreneurship	It was found that when women are in action as business owners, it is directly associated with a nation's social and economic development.	LLHL
Eriksson et al., (2020)	The opportunities and challenges of entrepreneurial digital competencies for women tourism entrepreneurs in Latin America from a gendered perspective	A qualitative method of 33 interviews in Mexico and Ecuador.	The results show that women in the tourist industry may and have been empowered by using digital technologies, but they also face a number of obstacles and hurdles, such as a lack of digital competences and worries about work-life balance, safety, and security.	LHLL
Heilman & Okimoto (2023)	Women entrepreneurship has experienced great growth, and factors that explain the difficulty of women in undertaking an entrepreneurial career.	A systematic literature review of 2,848 between 1950 and 2019, using the Scopus database	Six distinct research strands were identified through the cluster analysis, highlighting the significance of social entrepreneurship, entrepreneurial education, and the sociocultural context of reference (such as culture, family, and institutional support) as means of closing the gender gap.	HLUU
Bertrand et al., (2021)	Framework of how research in gender and entrepreneurship is conceptualized and positioned	A conceptual analysis of the previous literature on the constructs	The framework is based on reviewing and analyzing the current topics investigated at the intersection of gender and entrepreneurship.	HHHH
Xie & Tarba (2024)	Women entrepreneurs in sub-Saharan Africa: An institutional theory analysis from a social marketing point of view	A survey and quantitative analysis of questionnaire to respondents	The desire for personal improvement, recognition, and self-esteem pulled her to become an entrepreneur. The need for financial stability pushed her to get involved in this field for economic and social development.	LHHL

Key: H-High, L-Low and U-Unclear
Source: Author's Conceptualisation (2024)

3.0 METHODOLOGY

The study used a cross-sectional analysis deemed acceptable for the topic and permitted data collection from the community using questionnaire approaches. The population of the study consisted of women entrepreneurs in Kano State Nigeria. Due to the nature of women involved in entrepreneurial activities that are not registered, the study adopts a censor population of 368 sample respondents used in the analysis of this study. According to Kabuga et al. (2022), a sizable population sample should be chosen since conducting a survey with the entire population is practically not advisable. In light

of this, the sample size was chosen due to its degree of external validity, degree of accuracy, degree of confidence or risk, and degree of variability in the assessed characteristics (Patton & Marlow, 2017).

The respondents were asked to complete a self-administered questionnaire on a five-point Likert scale in order to provide primary data. A few management specialists ensured that the data obtained appropriately and internally represented the variables to be assessed to verify the study equipment. Before administering the questionnaire to the entire sample of respondents in the field, a pilot study was conducted on the selected portion of the population. The absence of appropriate values for one or more variables during data analysis is referred to as missing data (Katoch & Bukhari, 2021). The researchers stated that any instrument with an internal consistency rating of 0.70 or higher exhibits sufficient internal consistency.

Table 2: Reliability Test Analysis

S/N	Variables	Item retained	Reliability Coefficient
1	Remote work	6	0.833
2	Online market place	6	0.892
3	Entrepreneurial intention	6	0.891

Source: Author's Computation (2024).

However, descriptive and inferential statistics were employed to analyse the quantitative data. This conformed with the view of Valdez et al. (2022) that descriptive statistics are used for measuring central tendency such as mean score and standard deviation, which help in summarising the socio-economic and demographic characteristics of the respondents. Inferential statistics was used for testing the hypotheses and deriving estimates or acts of generalising from the sample to a population with a calculated degree of certainty.

4.0 RESULTS AND DISCUSSION

The profile of the respondents was analyzed by the researcher using their demographic characteristics in terms of age and academic qualification. The detailed analysis is presented in Table 3:

Table 3 Respondents Demographic Distribution by Age and Educational Qualification

Constructs	Value	Count	Percent
Age	20-25	20	2.4
	26-30	40	4.8
	31-35	35	4.22
	36-40	193	23.31
	41-above	540	65.27
	Total	**828**	**100**
Educational Qualification	ND/NCE	96	11.6
	HND/B.Sc	336	40.6
	MA/M.Sc/M.Ed	320	38.6
	Others	76	9.2
	Total	**828**	**100**

Sources: Field Survey (2024)

From Table 3, it was revealed that the women entrepreneurial in Kano State comprised of mature women who can comprehend the message in the questionnaire, and aside, they are well-versed in terms of knowledge, with the majority having BSc and Master degrees. This implies that they are capable of providing information to achieve the study's objectives.

Descriptive Analysis of Data and Interpretation

This section presents data from respondents on women entrepreneurs in the digital era. The data reflect women entrepreneurs' opinions in the digital era items stated in the questionnaire. The women entrepreneurs' variables include remote work, online marketplace and entrepreneurial intention. The respondents responded by selecting from the Likert scale from 1-strongly disagree to 5-strongly agree. The descriptive Table showing the mean scores and standard deviation (SD) of the instruments used for this analysis and the interpretations:

Table 4: Descriptive of Respondents and Interpretations

Descriptive Statistics	Min	Max	Mean	Std. Deviation
Remote work	30.00	44.00	39.8357	4.28852
Online market place	18.00	29.00	25.2609	2.82835
Entrepreneurial intention	29.00	39.00	33.7150	3.20835
Valid N (listwise)				

Source: Field Survey, 2024

The first item shows the remote work with a mean value of 39.8 and SD of 4.2. The second variable shows the online marketplace with a mean score of 25.2 and SD of 2.8 while the final variable shows a mean score of 33.7 and SD of 3.2. This implies that the items adopted for the instrumentation were significant in achieving the study's objectives.

Test of Hypotheses

Hypothesis 1

Ho1: ***There is no signifcant effect of remote work advocates on women's entrepreneurial intention***

Table 5: Model Summary[a]

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Durbin-Watson
1	.358[a]	.128	.127	2.89513	1.966

Predictors: (Constant), Predictors: (Constant), remote work

Dependent variable: women's entrepreneurial intention

The model summary, as indicated in Table 5 above, shows that R^2 is 12.8; this implies 13% of the variation in the dependent variable (women's entrepreneurial intention) was explained by the constant variables (remote work) while the remaining 87% is due to other variables that are not included in the model. Hence, remote work can determine women's entrepreneurial intention through poverty reduction at the rate of 13%.

Table 6: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1016.610	1	1016.610	121.288	.000[b]
	Residual	6923.371	826	8.382		
	Total	7939.981	827			

Predictors: (Constant), Predictors: (Constant), remote work

Dependent variable: women's entrepreneurial intention

Table 6 presents the results of an analysis of variation in the dependent variable with a large value of regression sum of squares (1016.610) compared to the residual SS with a value of 6923.371. This value indicated that the model does not fail to explain a lot of the variation in the dependent variables. However, the estimated F-value (121.288) is given in the Table with a significance value of 0.000, which is less than p-value of 0.05 ($p<0.05$).

Table 7: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	24.739	.941		26.302	.000
	Remote works	-.259	.023	-.358	-11.013	.000

Dependent variable: women's entrepreneurial intention

The dependent variable shown in Table 7 explains the influence of remote work on women's entrepreneurial intention through poverty reduction. This was used as a yardstick to examine the influence between the two variables. However, the remote work-test coefficient is -11.013, and the P-value is 0.000, less than 0.05. From the table β-value for remote work is low (i.e. 35.8%),

indicating a low impact on women's entrepreneurial intention through poverty reduction, with a p-value less than 0.05. This means that this variable is statistically significant at a 5% significance level. The summary of this regression outcome about the coefficient of remote work significantly influences women's entrepreneurial intention through poverty reduction. The null hypothesis is rejected, while a significant effect of remote work advocates on women's entrepreneurial intention is upheld.

Hypothesis 2

*Ho_2: **There is no significant influence of digital online marketplace on women's entrepreneurial intention**.*

Table 8: Model Summary[b]

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Durbin-Watson
1	.698[a]	.488	.487	1.82722	1.293

Predictors: (Constant), Predictors: (Constant), digital online marketplace

Dependent Variable: women entrepreneurial intention

The model summary, as indicated in Table 8 shows that R^2 is 48.8. This implies that 49% of the variation in the dependent variable (digital online marketplace) was explained by the constant variables (women's entrepreneurial intention). In comparison, the remaining 51% is due to other variables not included in the model. Hence, a digital online marketplace can determine women's entrepreneurial intention at the rate of 49%.

Table 9: ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2624.394	1	2624.394	786.046	.000[b]
	Residual	2757.790	826	3.339		
	Total	5382.184	827			

Predictors: (Constant), Predictors: (Constant), digital online marketplace

Dependent Variable: women entrepreneurial intention

Table 9 presents the finding of variation in the dependent variable with a large value of regression sum of squares (2624.394) compared to the residual SS with a value of 2757.790. This value indicates that the model does not explain much of the variation in the dependent variables. However, the estimated F-value (786.046) is given in the Table with a significance value of 0.000, which is less than the p-value of 0.05 ($p<0.05$).

Table 10 Coefficients[b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.447	.571		9.539	.000
	Digital online marketplace	.630	.022	.698	28.037	.000

a. Dependent Variable: women's entrepreneurial intention

The dependent variable in Table 10 explains the influence of the digital online marketplace on women's entrepreneurial intention. This was used to examine the influence between the two variables. However, the digital online marketplace-test coefficient is 28.037 and the P-value is 0.000. From the above Table, the β-value for the digital online marketplace is high (i.e., 69.8%), indicating a high impact on women's entrepreneurial intention, with a p-value less than 0.05. The summary of this regression outcome concerning the coefficient shows that the digital online marketplace significantly influences women's entrepreneurial intention. The null hypothesis is rejected, while a significant influence of digital online marketplace on women's entrepreneurial intention is supported/upheld.

DISCUSSION OF FINDINGS

The first hypothesis showed R^2 is 12.8; this implies that 13% of the variation in the dependent variable (women entrepreneurial intention) was explained by the constant variables (remote work). This implies that the regression outcome concerning the remote work coefficient significantly influences women's entrepreneurial intention through poverty reduction. This finding is in tandem with Welter and Brush (2023), who found the challenges, opportunities, and strategies women entrepreneurs adopt in leveraging digital technologies for business growth by comparing international contexts. Likewise, the study by Nelson and Nelson (2022) sheds

light on the nuanced intersections of gender, technology, and entrepreneurship, offering insights crucial for policymakers, business leaders, and aspiring female entrepreneurs navigating the complexities of the digital age.

The second hypothesis showed the R^2 is 48.8. This implies that 49% of the variation in the dependent variable (digital online marketplace) was explained by the constant variables (women's entrepreneurial intention). This implies that the regression outcome concerning the coefficient shows that the digital online marketplace significantly influences women's entrepreneurial intention. This finding can be supported by Dhillon and Bhatia (2019), who found a transformative potential of digital technologies in empowering women entrepreneurs. Through an intersectional lens, it explores how access to digital tools can mitigate traditional barriers women face in entrepreneurship, such as limited access to finance, networks, and markets.

5.0 CONCLUSION AND RECOMMENDATIONS

This study has discovered that as remote work continues to gain traction, particularly in the wake of global events, it offers newfound flexibility and opportunities for women to pursue entrepreneurial ventures. By championing remote work practices, advocates empower women to balance work and personal responsibilities and cultivate an environment conducive to fostering their entrepreneurial aspirations. This symbiotic relationship underscores the pivotal role of remote work advocates in shaping the landscape of female entrepreneurship, paving the way for greater gender parity and innovation in the professional realm. Furthermore, through the accessibility, flexibility, and vast reach of these platforms, women entrepreneurs are empowered to pursue their business aspirations with greater confidence and ease. The digital landscape offers avenues for networking, skill development, and market exposure, leveling the playing field and fostering an environment ripe for female entrepreneurship to flourish. As we continue to witness the evolution of digital platforms, it is evident that they play a pivotal role in shaping and advancing women's entrepreneurial endeavors, driving innovation and economic growth in diverse communities worldwide. Based on the findings and conclusion, the following suggestions are offered:

a) Kano State Government should implement gender-sensitive policies that promote equal access to resources, including funding, education, and networking opportunities. This will open a collaborative approach to provide targeted support programs, mentorship initiatives, and skill-building workshops tailored to women in entrepreneurship.
b) Financial institutions and venture capitalists should proactively invest in women-led start-ups and businesses, recognizing their potential for growth and innovation. Establishing dedicated funds and investment vehicles for women entrepreneurs can help bridge the funding gap and provide them with the necessary capital to scale their ventures.
c) Educational institutions should prioritize entrepreneurship training for girls and young women, equipping them with the skills and confidence needed to thrive in the digital economy.

REFERENCES

Acs, Z. J., & Audretsch, D. B. (2020). Gender and Entrepreneurship in the Digital Age. *Small Business Economics, 54*(1), 1-10.

Adejumo, G. (2021). Indigenous entrepreneurship development in Nigeria: characteristics, problems and prospects. *Journal of Department of Business Administration, 2*(1), 2001, pp. 12–122

Aliyu, M. O. & Aminu, A. (2023). Labour migration in Nigeria: Unemployment and inflation. *Advances in Management, 21*(1), 1-17

Aliyu, M.O. & Ambali, T. T. (2022). Analysis of psychological contracts and discretionary behaviour of young enterpreneurs: *International Journal of Economic Behaviour,* 12(1), 5-25. DOI: https://doi.org/10.14276/2285-0430.3236

Amine, L.S. & Staub, K.M., (2019a). Women entrepreneurs in sub-Saharan Africa: An institutional theory analysis from a social marketing point of view. *Entrepreneurship Reg. Dev. 21*(2), 183–211.

Amine, L.S. & Staub, K.M., (2019b). Women entrepreneurs in sub-Saharan Africa: An institutional theory analysis from a social marketing point of view. *Entrepreneurship Reg. Dev. 21* (2), 183–211.

Anderson, J. C., & Gerbing, D. W. (2023). The Digital Era: Implications for Women Entrepreneurs. *Journal of Small Business Management, 54*(4), 1150-1172.

Babin, B. J., Mathias, J. K. & Zikmund, W. G. (2021). Women Entrepreneurs and Digital Innovation: A Qualitative Analysis. *Journal of Business Research, 70*(1), 1-10.

Bertrand, M., King, M. O. & Kramarz, F. (2021). Women Entrepreneurs in the Digital Economy: Evidence from France. *Labour Economics, 71*(1), 102020.

Capelleras, J. L., & Greene, F. J. (2022). Digital Technologies and Women's Entrepreneurship: Evidence from Spain. *European Journal of Development Research, 34*(2), 349-369.

Cardella, G.M., Hernández-Sánchez, B,R,, & Sánchez-García, J.C. (2024). Women Entrepreneurship: A Systematic Review to Outline the Boundaries of Scientific Literature. *Front Psychol., 23*(2), 00.

Carter, N. M., Henry, C., & Smith, E. (2021). Women Entrepreneurs in the Digital Age: Overcoming Gender Barriers to Innovation. *Entrepreneurship Theory and Practice, 42*(3), 356-382.

DeSantis, L., & Durante, F. (2016). Digitalization and Women's Entrepreneurship: Insights from Italy. *International Journal of Gender and Entrepreneurship, 8*(2), 168-187.

Dhillon, G., & Bhatia, S. (2019). Empowering Women Entrepreneurs through Digital Technologies: A Review. *International Journal of Entrepreneurial Behavior & Research, 25*(5), 1032-1055.

Eriksson, P., Kallam, M. & Kovalainen, A. (2020). Digitalization and Women's Entrepreneurship: A Comparative Study of Success Factors. *Journal of Business Venturing, 35*(2), 1-16.

Fang, H., & Xiao, J. J. (2017). *Women Entrepreneurs in China*: Digital. New Delhi: McGraw Hill Inc.

Foss, N. J., Lyngsie, J., & Zahra, S. A. (2021). Women Entrepreneurs in the Digital Era: A Resource-based View. *Strategic Entrepreneurship Journal, 15*(3), 335-357.

Gartrell, C. D., & Gartrell, J. W. (2022). The Role of Social Media in Empowering Women Entrepreneurs: A Case Study of Digital Platforms. *Journal of Marketing Management, 38*(7-8), 678-695.

Goyal, M., & Parkash, J. (2023).Women entrepreneurship in Indiaproblems and prospects. *International Journal of Multidisciplinary Research, 1*(5), 195–207

Heilman, M. E., & Okimoto, T. G. (2023). Women Entrepreneurs and Digital Disruption: Exploring the Role of Stereotypes. *Academy of Management Perspectives, 30*(3), 245-263.

Islam, M. M., & Haque, A. (2024). Women Entrepreneurs in Bangladesh: A Digital Revolution. *International Journal of Gender and Entrepreneurship, 9*(4), 432-451.

Jack, S. L., & Anderson, A. R. (2018). Gendering Digital Entrepreneurship: Opportunities and Challenges for Women Entrepreneurs. *International Small Business Journal, 36*(5), 565-586.

Kabuga, N. A., Takuti, S. M., & Ahmad, A. Y., (2022). Assessing the impact of informal markets for electricity on the Performance of Microenterprises in Kano Metropolis, Nigeria. A paper presented at 2nd International Conference and Doctoral Colloquium organised by Faculty of Social and Management Sciences, Bayero University, Kano-Nigeria to hold from 27th to 28th November 2018.

Katoch, P., & Bukhari, S.S. (2021). The theoretical comparative analysis on digital women entrepreneurship. Academy of Marketing Studies Journal, 25(S3), 1-4.

Kim, Y., & Kim, K. (2019). Digital Literacy and Women's Entrepreneurial Intentions: The Mediating Role of Self-Efficacy. *Journal of Business Research, 103*(1), 103-112.

Lerner, M., & Almor, T. (2020). Digital Technologies and Women's Entrepreneurship: Evidence from Israel. *Journal of Small Business Management, 58*(3), 548-568.

Madsen, T. L., Robbins, T. & Bäckström, K. (2021). Exploring Digital Networks for Women Entrepreneurs: A Social Capital Perspective. *Entrepreneurship & Regional Development, 33*(1-2), 154-177.

Nelson, T., & Nelson, M. (2022). Women Entrepreneurs and Digital Marketing: Leveraging Social Media for Business Growth. *Journal of Interactive Marketing, 48*(1), 45-58.

Özbilgin, M., & Woodward, D. (2016). Intersectionality, Europeanization, and Women's Entrepreneurship: The Case of Digital Start-ups. *International Small Business Journal, 34*(5), 595-615.

Patton, D., & Marlow, S. (2017). Women Entrepreneurs in the Digital Age: A Cross-country Analysis of Motivations and Challenges. *International Journal of Gender and Entrepreneurship, 9*(3), 314-336.

Piaget, J. (1964). Cognitive Development in Children: Development and Learning. Journal of Research in Science Teaching, 2, 176-186. http://dx.doi.org/10.1002/tea.3660020306

Quinn, B., Armstrong, T. & Webb, J. W. (2018). The Impact of Digital Technologies on Women's Entrepreneurship: Evidence from the US. *Journal of Business Venturing Insights, 9*(2), e00096.

Ratten, V., & Tajeddini, K. (2019). Women Entrepreneurs in the Digital Era: A Global Perspective. *International Journal of Entrepreneurial Behavior & Research, 25*(2), 302-325.

Sarasvathy, S. D. (2008). Effectuation: Elements of Entrepreneurial Expertise. Cheltenham: Edward Elgar Publishing. https://doi.org/10.4337/9781848440197

Schumpeter, J. (1949). Economic Theory and Entrepreneurial History. In R. R. Wohl (Ed.), Change and the Entrepreneur: Postulates and the

Patterns for Entrepreneurial History (pp. 131-142). Cambridge, MA: Harvard University Press.

Schumpeter, J. A., & Shaver, J. M. (2020). Digitalization and Women's Entrepreneurship: Insights from a Longitudinal Study. *Journal of Evolutionary Economics, 30*(1), 1-24.

Thompson, J. L., & Smith-Hunter, A. E. (2021). Women Entrepreneurs and Digital Innovation: The Role of Knowledge Networks. *Journal of Business Research, 131*(2), 117-127.

Valdez, M. E., Terry, B. & Richardson, G. (2022). Digital Transformation and Women's Entrepreneurship: A Conceptual Framework. *Journal of Small Business Management, 60*(2), 368-387.

Vygotsky, L., & Cole, M. (2018). Lev Vygotsky: Learning and Social Constructivism. Learning Theories for Early Years Practice, 58.

Welter, F., & Brush, C. (2023). Women Entrepreneurs in the Digital Era: An International Comparative Study. *Entrepreneurship Theory and Practice,* 40(4), 919-938.

Xie, X., & Tarba, S. Y. (2024). Women Entrepreneurs and E-commerce: Exploring Digital Business Models. *Journal of Business Research, 79*(1), 227-236.

Yitshaki, R., & Kropp, F. (2018). Digital Platforms and Women's Entrepreneurial Opportunities: A Multi-level Perspective. *International Small Business Journal, 36*(1), 23-41

Zhang, Y., Yusro, L. & Cuervo-Cazurra, A. (2019). Digital Disruption and Women's Entrepreneurship: A Cross-country Study. *Journal of World Business, 54*(2), 100966.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

FOREIGN DIRECT INVESTMENTS, INSTITUTIONS AND HUMAN CAPITAL: A TRIADIC ANALYSIS OF SUSTAINABLE DEVELOPMENT IN NIGERIA

Rasak Adetunji ADEFABI
Department of Economics
Emmanuel Alayande University of Education, Oyo
Email: *adefabiadetunji@gmail.com*

ABSTRACT

The study aimed at investigating the triadic roles of FDI, Institutions and Human capital in fostering sustainable development in Nigeria using annual data from 1990 - 2023. In analyzing the objectives, pre tests were conducted on the data sets through descriptive statistics, multicollinearity (correlation matrix) and unit root tests. The study established the stationarity of the data used by the ADF test which revealing a mixed co- integration in levels (1(0)) and in first differences (1(1)). The multicollinearity result revealed that there is no tendency for multicollinearity to occur among the independent variables. A long-run relationship between the regressed and the regressors were estimated through Johansen Co-integration based on the rejection of the null hypothesis at 5% level of significance. The ARDL technique was employed with the estimation results revealing that a unit change in sustainable development is influenced by a unit change in the independent variables both in the long- and short-run relationships. Also, the R squared statistics established the efficacy of institutions, quality of manpower and FDI jointly accounting for 78% variation while exhibiting both negative and positive impacts on sustainable development. This is supported by higher adjusted R^2 value of 69%. Government should therefore create an enabling environment for the society to engage its leadership challenges to stamp out impediments deterring its ability to boost effectiveness of FDI on sustainable development in Nigeria. Appropriate policies must be devised to improve the quality of institutions and enhance the quality of human capital to attract more FDI and further enhance sustainable development in Nigeria.

Keywords: *ARDL, FDI; Human capital, Institution, Sustainable development*

JEL Classification: F21, O15, O43, Q01, C32

1.0 INTRODUCTION

Foreign Direct Investment (FDI) is an investment made by a firm or individual from one country into the business interests of another. FDI typically entails acquiring ownership or control of a large share of a business or physical assets in a foreign country, such as factories, infrastructure, or companies. Nigeria's foreign investment inflows have recently fallen by 26.7 percent, to US$3.9 billion in 2023, down from US$5.3 billion in 2022. The decline was engineered by a consistent drop in foreign investment inflows in the first three quarters of 2023 as a result of institutional and macroeconomic instability, such as political risks, economic, insecurity and legal stability of the recipient country. It is ascertained that investors are reluctant to establish ownership of foreign companies or set up businesses abroad if corruption or political or social instability are likely to jeopardise their operations (Economic Report of the President, 2004).

The United Nations highlights the persistent challenge of high poverty rates in African countries. In 2021, an alarming 490 million people in Africa, approximately 36% of the population, were living in poverty. Nigeria, as Africa's largest economy and the third-largest recipient of Foreign Direct Investment (FDI), has a concerning 46% poverty rate, with 90 million people living in extreme poverty out of a population of approximately 210 million. Looking forward, between 2011 and 2020, Nigeria emerged as one of the leading destinations for FDI in Africa, ranking second in net inflow with $45.1 billion, following only Egypt at $56.2 billion, and surpassing South Africa's $41.3 billion inflow (Oyefabi, et al 2021). In recent times, Nigeria's foreign investment inflows fell by 26.7 percent to US$3.9 billion in 2023 from US$5.3 billion in 2022. The decline was orchestrated by the consecutive drop in foreign investment inflows in the first three quarters of 2023 due to the impacts of institutions and macroeconomic instability such as political risks, economic, insecurity and legal stability of the recipient country.

Ilemobola, Mary, Abimbola, Bolatito, (2021) explained that FDI spillover effect on the host countries does not occur instantaneously but rather depends on the host countries' absorptive capacity, determined by diverse factors such as the host country's institutional quality. International Monetary Fund (2003) defines a country's institutional quality as the extent to which property rights are protected, the level to which rules and regulations are enforced fairly, as well as the level to which corruption

exists. International development agencies and non-governmental organisations (NGOs) have been campaigning for "good governance" and institutional changes to boost institutional quality to improve the investment climate and stimulate growth in developing nations. These measures are considered critical for sustainable development and attracting FDI. Prior studies have found that institution positively and significantly impacted FDI inflow in Asia and Latin America (Gani 2007), SAARC, Central Asian countries and the ASEAN region (Ullah and Khan 2017). Other studies have showed and suggested that dimensions of institutional qualities such as corruption, political stability, rule of law, violence and terrorism also affect human capital development (Borja, 2020).

Sustainable development is strongly linked to a country's human, physical, and natural resources used in production and services. Improving human, physical, natural resources and institutional quality may lead to long-term development and sustainability. Sustainable development (SD) is referred as a technique of economic and social advancement that aims to ensure not only current needs but ensuring the needs of future generations without any impediments. The General Assembly of United Nations, comprising 193 members, approved the Sustainable Development Goals (SDGs) in 2015, including a set of 169 targets (Sachs, Schmidt-Traub, Kroll, Lafortune, Fuller, Woelm, 2020). Additionally, Guo & Madni, (2024) found that institutional quality also played a moderating role in achieving sustainable development, especially among regionally connected countries. The findings suggested that sustainable development is strongly linked to a country's productive capacities. Further that improving productive capacities and institutional quality may lead to long-term development and sustainability.

STATEMENT OF THE PROBLEM

In most developed and developing countries, institution drives the main principles of macroeconomics such as trade, expenditure, employment, inflation and deflation, investment etc. Considering FDI from a macro perspective, it is often regarded as the generator of employment, high productivity, competitiveness and technology spillovers. For the least developed countries, for example, FDI means higher exports, access to international markets and international currencies, being an important source of financing, substituting bank loans, (Vintila, 2010; Adefabi, 2011). In the past few decades, governments have failed to play an important role in fostering human capital acquisition. However, the inability of human capital in influencing effectiveness of FDI has been attributed to weak institutional quality which has consequences for the achievement of sustainable development in Nigeria. A number of literature have grown tremendously on a separate entity on FDI, institution, human capital, sustainable development and the likes. Despite its importance, the interplay between institution, human capital, FDI and sustainable development in Nigeria remains understudied in the literature, with a notable lack of empirical research examining their triadic relationships and impact on sustainable development outcomes. For example, Renhan & Ghulam (2020) examined how productive capacities affect sustainable development, with a moderating impact of institutional quality; Adegboye et al. (2020) evaluated the effect of institutional problems on FDI inflow and how it affects economic growth in sub-Saharan African host countries (SSA); (Kaulihowa & Adjasi, 2019; Henok & Kaulihowa, 2021; Ali, Moosa & Vikash Ramiah, 2021; Zhuang, 2017; Fagbemi & Osinubi, 2020; Kheng et al, 2017; Vrinda, 2017) investigated the impact of FDI on human capital development; Fagbemi et al. (2022) assessed the effect of corruption on the growth of the human capital in Nigeria; Githaiga & Kilong, 2022; Adediran, 2020) investigated the moderating effect of institutional quality, foreign capital flow and human capital development in sub-Saharan Africa and Preethu, Zhihe &· Mohammad, (2023) which examined the effect technological innovation, foreign investment, trade and human capital on economic growth. Going by the highlighted studies there were concerns regarding the long term impacts of the triadic factors of institution, human capital and FDI in sustaining the life satisfaction, happiness and well – being of the people as opposed to the focus of economic growth on the short – term gains and profit maximization as measured by the country's gross domestic product. Thus, it is against this backdrop that this study intends to investigate the triadic impact of institution, human capital and FDI on sustainable development in Nigeria. The study was guided by the following research questions:

(i) To what extent do institution and human capital influence FDI in spurring sustainable development in Nigeria?

(ii) Does any significant relationship exist among institutions, human capital, FDI and sustainable development in Nigeria?

2.0 LITERATURE REVIEW

A number of substantiated research has focused on key determinants affecting sustainable development goals in Nigeria, among which are technological innovation, foreign investment, trade openness, human capital, and other mediating factors that are believed to influence all kinds of development in the country. As a matter of fact, a sustainable economic growth in the country results in a higher national income and more employment, resulting

in a higher standard of living (Mohamed et al. 2022) that is capable for achieving sustainable development. However, poor institution has also become a policy concern of most of the researchers and scholars in the world over as it perceived to increased costs of investment, Nigeria in particular. In several countries, the frail rule of law permits resource misappropriation through inducement, corruption, and opportunistic attitude. Nonetheless, a negative relationship does exist amid challenges of institutional quality and the rate of FDI inflows that countries receive, implying that, the weaker the problems of institutional quality detected, the lesser the likely inflow of FDI the economy will possibly receive (Chand, 2014; Adegboye et al., 2020a).

Consequently, several efforts and emphases have been recorded by successive governments in the region to globally integrate their countries to increase the inflow of capital through FDI in their respective countries. In turn, it will help in achieving sustainable development goals (SDGs), after previous attempts at millennium development goals (MDGs). Meanwhile, the level of institutions for the recipient country is considered an essential factor that can be used to drive FDI. It measures the amount of FDI inflow that can benefit the country. On the one hand, recent evidence shows that more companies are growing via FDI in several industries in African countries. It is evident from the relatively increased level of FDIs seen in Sub-Sahara African countries over the preceding years. But, conversely, foreign direct investments by multinational companies in most SSA countries usually rely on natural resources of host countries, particularly agriculture, manufacturing, and oil production (Adegboye et al., 2020b).

Some theories emphasise the direct effects of FDI, such as: employment, the salary, while other theories emphasise the indirect effects, such as: the transfer of technology and knowledge, changes in market structure and the level of competition in the host countries. However, the level of technology transfer from foreign investors depends on the strategy of local authorities and foreign investors. Theoretically, the importance of human capital as a determinant of FDI inflow has been demonstrated by many scholars. Lucas (1990) presents a model to show that human capital is crucial in determining foreign capital flows to rich countries benefiting both the investing and the host country. Zhang and Markusen (1993) present a model to show that availability of skilled workforce in host countries is the "direct requirement'' of multinational corporations. Human capital development is essential to reinforce the benefits of FDI on economy.

The heterogeneous studies in view of FDI in most economies and other sustainable indicators, such as human capital, needs to be given more attention among researchers especially in Nigerian context. The role of human capital in attracting FDI has been examined theoretically and empirically. Miyamoto (2003) demonstrates that enhanced human resource provides a benign environment for foreign investment that works through the direct effect of upgraded skill and the indirect effects of socio-political stability and health. Human capital, measured in terms of the education and skills of the labour force, should attract FDI because state-of-the-art technology and modern techniques of production, which are presumably used by multinationals acting as the source of FDI, require a skilled labour force.

In this case, the quality of human capital in the host country may discourage FDI inflows. Thus, it is possible to find evidence for all of these states of affairs, represented by positive, insignificant and negative effects of human capital on FDI. The Zhang–Markusen theory was tested empirically by Akin and Vlad (2011) who presented partly supportive findings – more specifically, that FDI is significantly higher in countries with high levels of education. Evidence on the relationship between human capital and FDI remains mixed, as the relevant studies show positive, negative, zero, significant and insignificant effects of human capital, measured in various ways, on FDI. On the positive side, human capital has been found to be one of the determinants for the direction of FDI flows by Brooks et al. (2010) who show that human capital boosts FDI inflows, particularly in skilled labour-intensive sectors where the level of education is conducive to technological innovation and productivity improvement. Likewise, Noorbakhsh et al. (2001) found that human capital is one of the key determinants of FDI inflows, and that the effect grows over time.

The empirical evidence is indeed mixed, perhaps due to the desirability to produce the kind of evidence that supports prior beliefs (positive, negative or no effect). The hypothesis that human capital in host countries is a determinant of FDI inflows has been tested repeatedly, but no clear-cut conclusion has emerged. It is theoretically plausible and intuitively appealing to suggest that skilled labour in host countries attracts FDI. Lucas (1990) and Easterlin (1981) note that low skills and inadequate levels of training have an adverse effect on the rate of return on FDI, which deters capital inflows. This is particularly the case in capital-intensive investment projects, where modern technology requires highly skilled people. Zhang and Markusen (1999) present a model where the availability of skilled labour in the host country is a direct requirement of multinational firms, which necessarily means that it affects the volume of FDI inflows. They refer to a "development trap" for small countries where skilled labour is scarce.

Internal FDI can be discouraged by low levels of human capital because physical capital is less productive at low levels of human capital. Rizvanolli (2012) refers to results showing that while human capital appears to be one of the most important determinants of FDI, it becomes significant only when more recent years (after 1991) are included in the sample (hence, sensitivity to the time period). Checci et al. (2007) find that net FDI inflows (as a percentage of GDP) are positively influenced by the share of population who have attained secondary education (or above). However, the share of population with tertiary education attainment does not appear to affect FDI inflows in their sample of 63 developing countries in the period 1985–2000 (hence, sensitivity to the definition and measurement of human capital). It seems that confirmation bias plays a role in the reporting of positive results, which is made possible by the ability of the researcher to estimate 1,000 equations and report one only.

Foreign direct investment (FDI) is critical for boosting international capital flows, and it has piqued the interest of many experts. FDI can boost the host country's export capacity, resulting in higher foreign exchange revenues for the developing country. However, Ilemobola, Mary, Abimbola and Bolatito (2021) opened that the FDI spillover effect on the host countries does not occur instantaneously but rather depends on the host countries' absorptive capacity, determined by various factors like the quality of the host country's institutional quality. The factors that most strongly influence inbound FDI include bureaucracy, corruption, information, the banking industry, and legal institutions using data collected from 52 nations during the years 1985 to 2000 Bénassy-Quéré et al. (2007).

Nigeria, Africa's largest economy and third FDI recipient, has a 46 per cent poverty rate, with 90 million people living in extreme poverty out of a population of approximately 210 million. Between 2011 and 2020, Nigeria was one of the leading African destinations for FDI. Nigeria was ranked second in terms of net inflow of $45.1 billion, following only Egypt, which attracted $56.2 billion, and one spot ahead of South Africa, which received $41.3 billion. Despite the inflow of foreign direct investment into Nigeria, the countries' inability to attract the required level of investment to make it up to its economy has been a major challenge. Nigeria still suffers from large prevalence of resource gaps due to domestic financial systems' inability to mobilise adequate resources (UNCTAD, 2020). Thus, the quest for sustainable development through favourable foreign investment policies has not been readily actualised. Nigeria is still characterised by unimpressive poor macro-economic performance low per capita income, high unemployment rates and the level of economic transformation has been low (Adeyeye et al., 2017).

FDI, Institutions, Human Capital and Sustainable Development Nexus

Foreign Direct Investment (FDI), institutions, and human capital development are all interconnected pillars that spur sustainable development of both developing and developed countries. Foreign direct investment brings in capital, technology, and expertise, which can considerably enhance a country's economic growth. However, the efficacy of FDI in promoting sustainable development is dependent on the quality of institutions including governance, legal frameworks, and regulatory systems that create transparent and stable investment environments. Strong institutions ensure that FDI promotes equitable growth, environmental sustainability, and long-term economic resilience.

At the same time, human capital reflected in a people's education, skills, and health is critical for capitalising on the benefits of foreign direct investment. A well-educated and skilled workforce attracts higher-quality investments and assures that knowledge transfer from FDI leads to innovation, increased productivity, and general improvement in living conditions. Countries can stimulate the benefits of FDI by investing in human capital and maintaining good institutions, ensuring that it complies with their sustainable development goals (SDGs), which support equitable economic advancement, social well-being, and environmental preservation.

Institutions and human capital are two divergent operational concepts that are essential for driving all kinds of development, social progress, and individual well-being. Institutions refer to established rules, norms, and practices that govern social behaviour and interactions within a society or an organization. In countries with secure and well-protected property rights, people are incentivized to make domestic and foreign investments that boost every development sector. Otherwise, investment lags behind. Poor institutions impede FDI and can act like a tax, thus increasing the cost of FDI (Buchanan et al. 2012).

3.0 EMPIRICAL REVIEW

A number of empirical articles have shown solid evidence that FDI stimulates sustainable development, particularly in developing countries with sound institutional and quality human capital. Thus, Githaiga & Kilong, (2022**)** investigated the moderating effect of institutional quality on the relationship between foreign capital flow and human capital development in sub-Saharan Africa. The results demonstrated a positive relationship between remittances, foreign direct

investment (FDI), institutional quality and human capital development. Official development assistance (ODA), on the other hand, has a negative and significant effect on human capital development. The findings further revealled that the effect of remittances and FDI on the human capital development was moderated by the institution's quality. Oyefabi, Abdul, Oladipupo & Oluwole (2021) studied moderating effect of institution in FDI-growth relationship in developing countries in Nigeria. The paper provided evidence of a long term relationship between FDI and economic growth as well as a significant unconditional positive impact of FDI on economic growth. Regarding the interactive effect of institutional quality (good governance) on the FDI growth effect, they found convincing evidence that institutional quality (good governance) alters the effect of FDI on economic growth favourably.

Nwosa & Babafemi, (2024) investigated the link between macroeconomic policy, inclusive growth, and institutional quality in Nigeria. The results showed that macroeconomic policy variables and institutional quality contributed significantly in enhancing inclusive growth in Nigeria. More so, it was observed that the interactive terms between macroeconomic policy variables and institutional quality enhanced inclusive growth Therefore, the study concluded that macroeconomic policy and institutional quality are important drivers of inclusive growth in Nigeria. Fagbemi & Osinubi (2020) assessed the interconnections between FDI and human capital development in Nigeria over the period 1981–2018. Findings reveal that the effect of FDI on human capital is found to be insignificant in the long run, while it is significant in the short run. However, following the asymmetric link, the empirical evidence reveals that a rise in FDI inflows to a certain rate, in the long-run, could result in a significant increase in the level of human capital development, suggesting that the magnitude of inward FDI matters in the economy.

Preethu, Zhihe &· Mohammad, (2023) examined the effect technological innovation, foreign investment, trade and human capital on economic growth Novel dynamic ARDL simulation study on Bangladesh. The findings indicated that technological innovation and human capital have a long-run symmetric relationship with Bangladesh's economic development. There is a significant correlation found between economic growth and all variables in the short run. Renhan & Ghulam (2020) examined how productive capacities affect sustainable development, with a moderating impact of institutional quality. They found that the relation between productive capacities and sustainable development is dynamic, positive, and significant. Additionally, institutional quality played a moderating role in achieving sustainable development, especially among regionally connected countries. Our findings suggest that sustainable development is strongly linked to a country's productive capacities.

Ali, Moosa & Vikash Ramiah, (2021) examined the effect of human capital on foreign direct investment (FDI). The results show no contradiction between firms seeking human capital and cheap labour. No matter what proxy is used to represent human capital, it turns out that the most important factor for attracting FDI is the variable "employee compensation", which is the wage. bill, implying that multinational firms look for cheap and also skilled labour in the host country. Adegboye, Osabohien, Olokoyo, Matthew & Adediran, (2020) evaluated institutional quality, foreign direct investment, and economic development in sub-Saharan Africa. This study reveals that foreign capital inflow is crucial for economic development in the SSA sub-region of Africa. Quality of institutions as determining factors also affected the level of inflow of FDI to the host SSA sub-region, which resulted in the underutilization of domestic resources and hence abnormal development of domestic sector investment.

Vrinda, (2017) examined human capital played a vital role in the distribution of foreign direct investments (FDI) across Indian states and attracts FDI to India. The results from the national level study, undertaken for the period 1975-2013 showed that the improvement in human capital does not cause growth in FDI inflows, and the growth in FDI inflows does not cause improvement in human capital. The results of panel regression, undertaken for period 2000-2010 showed that the differences in the endowment of human capital do not explain the variations in the distribution of FDI across the states; rather, size of the market reflected in the State Gross Domestic Product, availability of cheap labour, and infrastructure for power supply are the crucial factors affecting the FDI distribution across the states.

Adegboye et al. (2020) evaluated the effect of institutional problems on FDI inflow and how it affects economic growth in sub-Saharan African host countries (SSA). The research used combined data from 30 SSA countries between the years 2000 and 2018. The fixed and random effect regression model was used to estimate the effect of foreign capital on economic growth in the developing SSA sub-region of Africa, with considerations for the quality of institutions. The report confirmed that FDI is critical for economic growth in Africa's SSA sub-region.

4.0 METHODOLOGY AND MODEL

4.1. Model Specification

The study follows the endogenous growth model as in Mankiw, Romer and Weil (1992). The endogenous growth model is specified thus;

$Y = AK^{\alpha}L^{1-\alpha}$ .....(1)

Equation (1) shows a Cobb–Douglas function where Y represents the total production in an economy. A represents total factor productivity, K is capital, L is labour, and the parameter measures the output elasticity of capital. For the particular case in which, the production function becomes linear in the capital and does not have the property of decreasing returns to scale in the capital stock, which would prevail for any other value of the capital intensity between 0 and 1. However, since our focus is on the institutional - led growth, the model includes indices of institutions and human capital as factors that explain potency of FDI on sustainable development (such as social, economic, environmental and institutional capacity) in Nigeria. This study adopted archetype of (Olayungbo & Adediran, 2017; Akinleye and Adekunle, 2019). The functional relationship is specified as follows;

SDP proxy by Economic Fitness Index (EFI) = f (FDI, HCI, CPI, GOVEFF, RLAW, CCRPT).....2

Where Y being the dependent variable is SDP which stands as a proxy for Economic Fitness Index measures countries' ability of product differentiation and degree of competitiveness in producing complex products, FDI is Foreign direct investment measured as a percentage of GDP, GOVTEFF is government effectiveness used as proxy for institutional quality, HCI is human capital index, CPI is Consumer price index, RLAW is rule of law, and CCRPT is control of corruption. Countries with better institutions and human capital are often better positioned to leverage their productive capacities for sustainable development. However, the econometric form of the functional relationship in eqn 2 is presented as follows:

Restating the model in an econometric form:

$$EFI_t = \beta_0 + \beta_1 FDI_t + \beta_2 HCI_t + \beta_3 CPI_t + \beta_4 GOVTEFF_t + \beta_5 RLAW_t + \beta_6 CCRPT_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

The equation (3) above is transformed to equation (4) below:

$$lnEFI_t = \beta_0 + ln\beta_1 FDI_t + \beta_2 lnHCI_t + \beta_3 lnCPI_t + \beta_4 lnGOVEFF_t + \beta_5 lnRLAW_t + \beta_6 lnCCRPT_t + \varepsilon_t \dots\dots (4)$$

Where β_0 is the intercept, β_1- β_6 are slope of the explanatory variables; ln represents the natural logarithm of variables; and ε is the error term, t denotes the time dimension. These variables are log-linearised to adjust for disparities in units and measurements

All independent variables are expected to be positive related with sustainable development (proxy by Economic Fitness).

4.2. ESTIMATION TECHNIQUE

In accounting for the short-run and long-run relationship of institutional framework and other variables in Nigeria, the study made use of a 3-prong econometric procedure. First, is the pre-estimation evaluation. These are the preliminary evaluation of the time series data using the descriptive statistics method in order to help show, describe and summarize the data in a meaningful way and also to avoid inconsistency in the regression analysis by establishing substitutability of the variables (Babatunde, 2007) as well as to confirm whether the data are normally distributed through their averages and Jarque-Bera values (Gujarati and Dawn, 2009). As a result, they provide a useful guide in the specification of the model.

Furthermore, the Augmented Dickey-fuller (ADF) unit root tests were deployed to ascertain the order of integration of the variables. This test of the time series data is required because a non-stationary regressor invalidates many standard empirical results. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. Also, the Johansen co-integration test was applied to establish whether there is a long-run relationship among the variables. The primary step in the Johansen cointegration test is to obtain the optimal lag length because the Johansen cointegration test is sensitive to lag length. If the lag length is too much, the test will give a spurious result. The optimal lag length was determined by the Schwarz Information Criterion (SC) (Koehler and Murphree, 1988).

The Autoregressive Distributed Lag (ARDL), both co-integration form and long-run coefficient among the variables is then conducted. In order to confirm the robustness and validity of the regression model, some post estimation tests were carried out such as Breusch-Godfrey Serial Correlation which tested for the presence of serial correlation, the Breusch Pagan Heteroscedasticity to test for heteroskedasticity of the model.

SOURCES OF DATA

Annual time series data spanning year 1990 to 2023 were used for the study as sourced from World Bank Development Indicators (WDI), CBN Statistical Bulletin, World Bank Database (World Governance Indicator, 2023), World Development Reports of various years, Human Development Reports, Bureau of Nigeria Statistical Bulletins.

5.0 RESULTS AND INTERPRETATIONS

5.1. Descriptive Statistics

Table 5.1: Descriptive Statistics of the Data Set

	EFI	FDI	HCI	CPI	RLAW	GOVTEFF	CCRPT
Mean	0.007349	2.99E+09	1.544778	3.975956	1.216333	12.63777	3.617637
Median	0.008073	2.01E+09	1.547831	4.196299	1.160920	11.90476	1.463415
Maximum	0.028460	8.84E+09	1.974245	6.042799	1.562196	20.58824	10.67961
Minimum	4.17E-06	-1.87E+08	1.011662	0.890357	0.842660	0.938739	0.095392
Std. Dev.	0.005719	2.63E+09	0.277895	1.384461	0.232458	4.848962	3.277530
Skewness	1.337989	0.874262	-0.206579	-0.641385	0.010122	-0.895919	0.860531
Kurtosis	6.541917	2.595842	2.012395	2.704221	1.594537	3.940148	2.259948
Jarque-Bera	27.09580	4.428436	1.575838	2.382850	2.716637	5.630020	4.825879
Probability	0.000001	0.109239	0.454790	0.303788	0.257093	0.059904	0.089552
Sum	0.242510	9.85E+10	50.97769	131.2065	40.13898	417.0465	119.3820
Sum Sq. Dev.	0.001047	2.21E+20	2.471213	61.33542	1.729181	752.3980	343.7505
Observations	33	33	33	33	33	33	33

Source: Authors computation (E-views), 2024; EFI = Economic Fitness Index, FDI= Foreign Direct Investment, HCI= Human Capital Index, CPI = Consumer Price Index, Rule of Law = RLAW, Government Effectiveness = GOVTEFF, Control of Corruption = CCRPT

Table 5.1 summarizes the entire variables that were used for the models showed the mean, median and standard deviation of all the observations in the data set lie within the maximum and minimum values indicating a high tendency of normal distribution. All the variables are positively skewed. The kurtosis statistics showed that all the variables were platykurtic, suggesting that their distributions were flat relative to normal. The Jarque-Bera statistics depicted that the series is normally distributed since the p-values of FDI, HCI, CPI, RLAW, GOVTEFF and CCRPT are not statistically significant at 5% level. Thus, this informing the acceptability of the null hypothesis that says each variable is normally distributed except EFI which is statistically significant at the 5% level.

Table 5.2: Correlation Matrix of the Data Set

Correlation t-Statistic Probability	EFI	FDI	HCI	CPI	RLAW	GOVTEFF	CCRPT
EFI	1						
FDI	0.370084	1.					
	2.218027						
	0.0340						
HCI	0.193161	0.529185	1				
	1.096119	3.472425					
	0.2815	0.0015					
CPI	0.439737	0.397376	0.439541	1			
	2.726069	2.411029	2.724560				
	0.0104	0.0220	0.0105				
RLAW	-0.415287	-0.341774	-0.346551	-0.870553	1		
	-2.541762	-2.024850	-2.056981	-9.850211			
	0.0162	0.0516	0.0482	0.0000			
GOVTEFF	-0.090318	0.254803	0.128915	0.168010	-0.166271	1	
	-0.504934	1.467110	0.723811	0.948928	-0.938826		
	0.6172	0.1524	0.4746	0.3500	0.3551		
CCRPT	0.328897	0.227572	0.370894	0.701668	-0.809284	0.090601	1
	1.939101	1.301209	2.223655	5.483082	-7.670691	0.506529	
	0.0616	0.2028	0.0336	0.0000	0.0000	0.6161	

Source: Authors computation, 2024

A number of studies have argued that testing of the correlation among the data series of estimates would make the researchers detect whether the variables have high multicollinearity among themselves. As a result, the parameter estimates may contradict what the theory says due to unexpected effect of multicollinearity among the independent variables Hamsal, (2006); Agung, (2009); Oseni (2016). However, Iyoha (2004) argued that multicollinearity among variables occur when the result of the correlation coefficient is above 0.95.

In corroboration with this vindication, the study presents the results of the correlation analysis of the set of variables employed in Table 5.2 above. The table shows that the correlation coefficients among the variables are below 0.95, indicating that there is no tendency for multicollinearity to occur among the independent variables.

5.2. Time Series Properties of the Variables

In ascertain the stationarity of the data used for the study, ADF test was carried out based on the conventional criterion of at level, first difference and second difference, below 5% level of significant was probability threshold of acceptability of datasets. Hence, below is the outcome of the series unit root test.

Augmented Dickey-Fuller Test (ADF)

Table: 5.3: Unit Root Summary

Variables	*@Level t-stat*	*Critical Value @ 5%*	*First Diff. t-stat.*	*Critical Value @ 5%*	*Prob.**	*Order of Integration*
EFI	-4.559433	-3.580623	--	--	0.0058	I(0)
FDI	--	--	-6.631621	-3.562882	0.0000	I(1)
HCI	--	--	-5.933019	-3.557759	0.0002	I(1)
CPI	-7.401931	-3.562882	--	--	0.0000	I(0)
RLAW	-2.464664	-1.964418	--	--	0.0175	I(0)
GOVTEFF	-5.290410	-3.004861	--	--	0.0003	I(0)
CCRPT	-3.756596	-3.612199	--	--	0.0376	I(0)

Source: Authors computation (E-views), 2024

The study employed Augmented Dickey-Fuller to determine the order of integration of the variables. It is observed that the variables are in mixed order of integration that is in level and in first difference where the p-values less than 5% significance level with their respective t-statistic and critical values at 5%.

5.3 Optimal Lag Length Selection

The implication of the lag length selected explains the effect of the outcome of the previous year on the current year. The selection of an optimal lag length was essential before carrying out a Johansen co-integration test, the result of which is presented in Table 5.4 below:

Table 5.4: Optimal Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-90.63278	NA	4.10e-05	9.765278	10.81178	9.831310
1	-13.63379	92.39879*	3.47e-06*	6.963378*	9.058400*	7.087933*

Source: Authors computation (E-views), 2024
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 5.4 portrays different lag length criterion such as LR, FPE, AIC, SC and HQ. The Schwarz Information Criteria depicting lag order length of (1) for the model is selected. After determining the lag order length, the co-integration, and long-run equation results was estimated and explained in the next table.

5.4. Co-Integration Test

Johansen Co-Integration Test

The result of the Johansen Co-integration for both the Trace Statistic and Maximum Eigen Value is reported in Table 5.5. With the hypothesized level of acceptance is 5 percent,

Table 5.5: Result of Johansen Co-integration test based on Trace Statistic and Max Eigenvalue

	Trace Statistic			Max. Eigen Value			
No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0,05 Critical Value**	**Prob. ****	**Max-Eigen Value**	**Critical Value**	**Prob.****
None *	0.807408	163.3444	125.6154	0.0000	51.06260	46.23142	0.0141
At most 1 *	0.739268	112.2818	95.75366	0.0023	41.67211	40.07757	0.0328
At most 2*	0.697137	70.60964	69.81889	0.0432	37.02875	33.87687	0.0203
At most 3*	0.429395	33.58089	47.85613	0.5248	17.39281	27.58434	0.0464
At most 4	0.304567	16.18808	29.79707	0.6990	11.25986	21.13162	0.6214
At most 5	0.145281	4.928226	15.49471	0.8164	4.866454	14.26460	0.7586
At most 6	0.001991	0.061771	3.841466	0.8037	0.061771	3.841466	0.8037

Source: Authors computation (E-views), 2024
Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The result simply means that there is a long-run relationship between the regressed and the regressors based on the rejection of the null hypothesis at 5% level of significance. The determination of the short run association is computed as follow.

5.6. ARDL Estimates

Having determined the fact that some of the explanatory variables in the model do have long-run relationship with the dependent variable it will applicable to also examine the direction of and magnitude impact of the relationship among the set of variables captured in the model. In this sense the aim is to obtain empirical estimates measuring the impact of regressors of on the dependent variable. For this purpose the Autoregressive Distributed Lag (ARDL) model which was established by Pesaran, Shin, and Smith (2001) and is employed where the dependent variable is function of its own past lagged values as well as current and past values of other explanatory variables. ARDL model comprised both long and short run forms. It is useful for forecasting and disentangles long-run relationship from short-run dynamics. The significance of the estimated coefficients is tested from the probability value of the estimated coefficients. If the probability value of the estimated coefficient is less than 5 percent then the then the explanatory variable has a significant relationship with the dependent variable. Hence the research hypothesis cannot be upheld.

Table 5.6: ARDL Estimates

ARDL Cointegrating and Long Run Form
Dependent Variable: EFI
Selected Model: ARDL(2, 1, 2, 3, 3, 2, 2)

Date: 06/15/24 Time: 10:18
Sample: 1990 2023
Included observations: 33

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EFI(-1))	1.069045	0.385978	2.769708	0.7182
D(EFI(-2))	0.711379	0.287433	2.474934	0.0309
D(LFDI)	3.782695	1.406779	2.688904	0.4911
D(LHCI)	-1.063009	3.176177	-0.334682	0.7442
D(LHCI(-1))	-33.064971	11.128815	-2.971113	0.0127
D(LCPI)	-2.002621	0.637006	-3.143801	0.1679
D(LCPI(-1))	-9.473914	0.876304	-1.681968	0.0347
D(LRLAW)	25.065396	7.787211	3.218790	0.0323
D(LRLAW(-1))	9.603589	8.392243	1.144341	0.3163
D(LRLAW(-2))	14.571050	9.604995	1.517028	0.2039
D(LGOVTEFF)	-6.298101	0.782505	-1.658905	0.1253
D(LGOVTEFF(-1))	4.236851	0.784137	1.577340	0.1430
D(LCCRPT)	-1.034936	0.690769	-1.498237	0.1497
D(LCCRPT(-1))	12.637060	0.753799	-2.967715	0.6176
CointEq(-1)	-0.715834	0.255714	-5.927853	0.0000

Cointeq = LEFI - (1.7146*LFDI -1.9961*LGOVTEFF + 15.6203*LHCI -9.3225) - (1.6239*LINFLR - 1.6280*LROFLAW - 7.8355) + 0.6693*LCNTRCRPT -5.7547)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	1.714580	0.547874	3.129513	0.0096
LHCI	5.620331	4.722218	3.307838	0.3870
LCPI	-2.453030	0.545357	2.961027	0.0337
LRLAW	1.627976	1.156639	-1.407506	0.2320
LGOVTEFF	-1.996100	0.617593	-3.232066	0.0180
LCCRPT	0.669325	0.273887	2.443795	0.8139
C	-5.754706	0.564972	-10.185826	0.0000

R-squared	0.787663	Mean dependent var	0.458154
Adjusted R-squared	0.696691	S.D. dependent var	0.174030
S.E. of regression	0.095845	Akaike info criterion	-1.596081
Sum squared resid	0.091862	Schwarz criterion	-0.739664
Log likelihood	40.34513	Hannan-Quinn criter.	-1.334266
F-statistic	4.648120	Durbin-Watson stat	2.481143
Prob(F-statistic)	0.008761		

Source: Author's Computation, (2024).
*Note: p-values and any subsequent tests do not account for model selection.

Short Run Interpretation

The above tables showed the results of ARDL in short-run and long-run form of the model. To begin with short-run, the table revealed that there was contemporaneous impact or effect of the previous values which also called the perceivialisation of the dependent variable, where we have EFI lag one and two in which EFI lag two was a significant determinants of EFI in the current year which

means EFI has a feedback impacts as a very important factor that gives a validity on robustness of the model because when you estimate ARDL model is expected that the lag value of the dependent variable should appear in the result to actually validate the estimation that have done.

Log of FDI is an important variable is found to be positively related to the dependent variable but it not significant at the probability value of 0.4911 which was greater than 0.05 significance level. However, the result showed that a unit increase in FDI is associated with 37% increase in EFI. The result is conformed with A-priori expectation sign which showed an indirect relationship with FDI. The result is not surprising because of the current situation of the economic hardship in the country is dwindling the level of production, affecting various developments and other financial sectors that contribute to the country's economic fitness.

Log of HCI was one of the determinant variables of interest which has negative impact on EFI in the short run and it is not significant, but its previous value of lag one, is having a negative impact on EFI and it is significant which means that as HCI expand or increase in short period of time its pass value have a tendency of actually causing a 33.3 unit reduction on EFI and it is not in line with a-priori expectation on EFI as at the period of this study. This result can be interpreted to the fact that more attention is needed to areas like education and health to boost the country human capital as a crucial determinant of sustainable development in Nigeria.

Log of CPI has negative impact on EFI in the short run in the short-run, but and not statistically significant while its previous value has negative impact on EFI but statistically significant. Which means that as CPI expand over a short period of time its pass value have a tendency of causing a 9 units reduction in EFI. This is not in line with a-priori expectation on EFI as at the period of this study. This result can be associated with present economic hardship in the country that worsens economic activities in the country thereby affecting sustainable development, Nigeria in particular.

The log of Rule of Law (LRLAW) result in the table conforms to A-pirori expectation. The result showed a positive impact on EFI proxied sustainable development of the country. It indicated that a unit change in RLAW will lead to about 25.1 increase in EFI. The result was significant at 0.0347. From the result, one can deduce that if judiciaries and legislators and the people in the country are complying with rules and regulations, the country will go a long way to achieve sustainable development.

Also, log of Government Effectiveness (LGOVTEFF) was another important variable of institution in Nigeria which has negative impact on EFI in the short run and it is not significant, but its previous value of lag one is having a positive impact on EFI and is not significant which means that as GOVTEFF expand or increase in short period of time its pass value have a tendency of actually causing a 4.2 unit reduction on EFI and this is not in line with a-priori expectation on EFI as at the period of this study. This result can be associated to corrupt practices surrounding every government system and other challenges such as poor governance and the likes worsening government effectiveness or performance.

Log of control of corruption (LCCRPT) was found negative related to EFI in the short run and it is not significant, but the pass time of lag one depicted a significant positive related to EFI. The result was conforms to A-priori expectation. From the result, 1 unit increase in CCRPT will lead to about 12.6 unit increase in EFI. However, the result is not significant at 5% level significance since the probability value of 0.6176 is greater than 5%. Hence, it becomes clear that failure of a country to control corruption will affect other sectors of development that can actually lead to sustainable development.

The error correction term or cointegrating equation one is another important factor in the short-run interpretation result. It becomes cleared that the error correction term fulfilled the three characteristics in the structure which was negative, less than one (-0.715834) and the probability value was found to be 0.0000 (significant) and accepted. This value of -1.515834 explained that the pass equilibrium associated in the model is scramble can actually errand to a long-run equilibrium at the speed of 72.5% parabola that implies that the pass problems can be adjusted at the speed of 72.5% which was high.

Long-Run Interpretation

The long run coefficient table explained the permanent relationship of the independent variables on the economic fitness (sustainable development) in Nigeria. It indicated that the positive coefficient (1.714580) was significant related to EFI at probability value 0.0096 that is 1 unit increases in FDI can influence EFI by 1.71 units in the long run. Also, human capital is positively related to EFI in the long run, but it is not significant at probability value 0.3870. In the case of consumer price index, it is negatively related to EFI and statistically significant at the probability value 0.0337. That is unit increase in CPI can reduce EFI by 2 units in the long run. Furthermore, the rule of law is found to be positive and insignificant related to EFI at the probability value 0.2320 which is higher than 5% level of significance, it indicated that a unit increases in RLAW can influence EFI by 1.63 units in the long run. GOVTEFF is an important variable of institution which has a negative

coefficient value and significant at probability value 0.0180 which means if GOVTEFF increase by 1 unit EFI decrease by 2 units in the long run. In conclusion, control of corruption is positively related to EFI and it is not significant since the p-value 0.8139 is higher than 5% level. It depicted that 1% increase in control of corruption influences EFI by 66% in the long run. The R-square statistics shows that explanatory variables accounted for 78% variation of sustainable development in the long run. This is supported by higher adjusted R^2 value of 69%. Also, the Durbin Waston Statistics value of 2.026517 falls within the rejection region of absence of serial correlation among the regressors. The Akaike info criterion, Schwarz criterion and Hannan-Quinn criterion value of 2.918529, 3.158499 and 2.989885 respectively indicates that the model selection is good as well as F-statistic 0.008761.

Table 5.7: Serial Correlation Test:

F-statistic	2.446345	Prob. F(2,8)	0.1482
Obs*R-squared	10.62581	Prob. Chi-Square(2)	0.2589

Source: E-views Output, 2024

Given the probability value of 25.89 units, we fail to reject the null hypothesis and conclude that our short run model is free from serial correlation.

Table 5.8: Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.584641	Prob. F(20,9)	0.2424
Obs*R-squared	23.36492	Prob. Chi-Square(20)	0.2712
Scaled explained SS	4.045392	Prob. Chi-Square(20)	0.9999

Source: E-views, 2024

The p-value (0.1237) of Obs* R-squared showed that we cannot reject the null hypothesis. This implies that residuals have a constant variance which is desirable. That is, residuals are homoskedastic.

Table 5.9: ARDL Bounds Test

Test Statistic	Value	K
F-statistic	6.889328	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

ARDL BOUNDS TESTING

Table 5.9 above indicated ARDL bounds test examine the long-run association among the study variables. In the long run, ARDL is statistically significant because the probability is less than 5%. ARDL explained that the bound test's F statistic value (6.889) is bigger than the lower bound (3.23) and upper bound (4.35) at 5%, showing that dependent and independent variables are interconnected in the long run.

5.0 CONCLUSION AND RECOMMENDATIONS

The study examined institutions, human capital, FDI and sustainable development in Nigeria between 1990 and 2023. In evaluating its objectives, ARDL modelling was adopted to assess the short- and long-run, positive and negative between independent variables and sustainable development proxied Economic fitness index in Nigeria. The empirical result indicated that control of corruption

at 0.1497, government effectiveness at 0.1253 consumer price index at 0.0347(-1) and human capital at 0.0127 have a negative relationship with sustainable development in the short run while rule of law and FDI at 0.0323 and 0.4911 respectively indicated positive relationship with sustainable development within the period of the study. The R-square statistics showed that explanatory variables accounted for 78% variation of sustainable development in the long run.

The model has a higher adjusted R-squared value of 69%, indicating strong explanatory power. The Durbin-Watson statistic value of 2.026517 falls within the rejection region, suggesting no serial correlation among the regressors. Additionally, the Akaike information criterion, Schwarz criterion, and Hannan-Quinn criterion values of 2.918529, 3.158499, and 2.989885 respectively, indicate good model selection. The F-statistic value of 0.008761 further supports this. The study recommends that the government should create an enabling environment to address leadership challenges and remove impediments hindering the effectiveness of FDI for sustainable development in Nigeria. Moreover, it suggests devising policies to improve institutions, infrastructure, and human capital to attract more FDI and enhance sustainable development. Lastly, it proposes policy measures prioritizing human capital to attract FDI and address structural bottlenecks, corruption, governance, and rule of law to encourage sustainable development and attract foreign investors.

REFERENCES

Adefabi, R. A. (2011). Effects of FDI and Human Capital on Economic Growth in Sub-Saharan. *Pakistan Journal of Social Sciences*. 8(1), 32-38.

Adegboye, F. B., Adesina, T. F, Ojeka S. A., Akinjare V. A., & Olokoyo, F. O. (2020a). Foreign direct investment, dual gap model and economic development in sub- Saharan Africa. *Cogent Soc Sci* 6(1):1743138. https://doi.org/10.1080/ 23311886. 2020.1743138.

Adegboye, F. B., Adesina, T. F., Ojeka, S. A., Akinjare, V. A., & Olokoyo, F. O. (2020). Foreign direct investment, dual gap model and economic development in sub-Saharan Africa. *Cogent Social Sciences*, *6*(1), 1743.

Adeyeye, P. O., Theuns, P., & Pelser, T. G. (2017). 'Foreign direct investment and economic growth in Africa: a comparative analysis', *Int. J. Sustainable Economy*, *9*(3), 183–198.

Agung, I. N. (2009). Time series data analysis using E-view. Clementi Loop, Singapore: John Wiley & Sons (Asia) Pte Ltd.

Akin, M.S. & Vlad, V. (2011).The relationship between education and foreign direct investment: testing the inverse U shape", *European Journal of Economic and Political Studies*, 4, 27-45.

Ali, A., Imad, M., & Vikash R, (2021). The contribution of human capital to foreign direct investment inflows in developing countries. *Journal of Intellectual Capital.* https://www.researchgate .net/publication/351286530

Ayomitunde, A.T., Olubunmi, A. B., Awomailo, L. B. & Omotay, O. H. (2019). Foreign direct investment inflows and regulation in Nigeria: An Empirical Perspective. *International Journal of New Economics and Social Sciences (IJONESS).* 9(1), 155 -166. Ijoness.com. doi: 10.5604/01.3001.0013.3040

Bénassy-Quéré, A., Coupet, M., & Mayer, T. (2007). Institutional determinants of foreign direct investment. *World Economy*, *30*(5), 764–782. https:// doi.org/10.1111/j.1467-9701.2007.01022.x

Bolatito Adewumi Oluwole4 (2021). Moderating Effect of Institution in FDI-Growth Relationship in Developing Countries: A Case of Nigeria. *Journal of Economics and Sustainable Development*, 12(22), 56-67.

Borja, K. (2020). Remittances, corruption, and human development in Latin America. *Studies in Comparative International Development*, *55*(3), 305–327. https://doi.org/10. 1007/s12 116-020-092 99-1

Brooks, D. H., Hasan, R., Lee, J. W., Son, H. H. & Zhuang, J. (2010). Closing development gaps: challenges and policy options", Asian Development Review, 27, 1-28.

Buchanan, B. G., Le, Q. V., & Rishi, M. (2012). Foreign direct investment and institutional quality: Some empirical evidence. *International Review of Financial Analysis*, *21*, 81–89. https://doi.org/10.10 16/j.irfa.2011.10.001

Chand, S. (2014). Factors that influence the economic development of a country. http://www.yourarticlelibrary.com /economics/factors-that-influence-theeconomicdevelopment- of-a-country/5942/

Checchi, D., De Simone, G., & Faini, R. (2007). Skilled migration, FDI and human capital investment (No. 2795). IZA Discussion Papers.

Dunning, J. H. (1988). The Eclectic Paradigm of International Production: A restatement and some possible extensions", in *Journal of International Business Studies* issue 19 (Spring).

Easterlin R.A. 1981. Why isn't the whole world developed? J. Econ. Hist. 41:1–17

Economic Report of the President, (2004). International Capital Flows. Chapter 13

Fagbemi, F. & Osinubi, T. T. (2020). Leveraging foreign direct investment for sustainability: An approach to sustainable human development in Nigeria. Resources Environment and Sustainability · November 2020 DOI: 10.1016/j.resenv. 2020 .100005. www.elsevier.com/locate/resenv

Gani, A. (2007). Governance and foreign direct investment links: evidence from panel data estimations. *Applied Economics Letters*, *14*(10), 753-756.

Gujarati, D. N. and Dawn. C. P. (2009). *Basic Econometric* (5th Ed.). New York: McGraw-Hill

Guo R, Madni GR (2024) Encirclement of productive capacities and institutions in context of sustainable development. PLoS ONE 19(3): e0297350. https://doi.org/10.1371/journal.

Guo R, Madni GR (2024) Encirclement of productive capacities and institutions in context of sustainable development. PLoS ONE 19(3): e0297350. https://doi.org/10.1371/journal. pone.0297350.Hamsal, M.(2006).*The effect of paradoxical strategies on firm performance :an empirical study of Indonesian banking industry*. Dissertation, Graduate School of Management, Faculty of Economics, University of Indonesian.

Henok, W., & Kaulihowa, T. (2021). The impact of FDI on human capital development in SACU countries. *International Journal of Social Economics*, *49*(2), 268–279.

Ilemobola Solomon Oyefabi*1 Mary Yusuf Abdul2 Abimbola Oluwaseun Oladipo3

Iyoha, M. A.(2004). Applied econometrics (Second Edition). Benin City, Nigeria: Mindex Publishing.

Kaulihowa, T., & Adjasi, C. (2019). Non-linearity of FDI and human capital development in Africa. *Transnational Corporations Review*, *11*(2), 133–142. https://doi.org/ 10.1080 /19186444 .2019.1635734

Kheng, V., Sun, S., & Anwar, S. (2017). Foreign direct investment and human capital in developing countries: A panel data approach. *Economic Change and Restructuring*, *50*(4), 341–365. https:/ /doi.org/10. 1007/s10644-016-9191-0

Koehler & Murphree (1988). A comparison of Schwarz and Akaike Criteria for selecting model order. *Journal of royal statistic society series*, 37, 187-195

Lucas, R.. E. (1990). "Why doesn't Capital Flow from Rich to Poor Countries." *The American Economic Review*, 80, no. 2:92-96.

Mengistu, B. & Adhikary, I. (2011). (2007). Foreign Direct Investment, Governance and Economic Development in Developing Countries. *Journal of Social, Political and economic development in sub-Saharan Africa*. 1-9, https://doi.org/10.1057/s41599-020-0529-x

Miyamoto, K. (2003). Human capital formation and foreign direct investment in develeping countries. *OECD Working Paper No. 211-DEV/DOC(2003)09*, 1-55. https://doi.org/1 0.213 9/ss rn.668505

Mohamed, M. M. A., Liu P., & Nie, G. (2022). Causality between technological innovation and economic growth: evidence from the economies of developing countries. Sustainability 14(6):3586.

Noorbakhsh, F., Alberto P., & Ali, Y.. (2001). "Human capital and FDI Inflows to developing countries: New Empirical Evidence." *World Development*, 29, no. 9:1593-1610.

Olayungbo, D. O. & Adediran, K. A. (2017). Effects of Oil Revenue and Institutional Quality on Economic Growth with an ARDL Approach. *Energy and Policy Research*, 4(1), 44-54.

Oseni, I. O. (2016). Exchange rate volatility and private consumption in Sub-Saharan African countries:A system-GMM dynamic panel analysis. *Future Business Journal (Elselvier)*, 2, 103–115

Oyefabi, I. S., Abdul M. Y., Oladipo, A. O. & Oluwole, B. A. (2021). Moderating effect of institution in FDI-Growth relationship in developing countries: A case of Nigeria. *Journal of Economics and Sustainable Development*, 12(22). Pp .56 -67 .www. iiste.org

Peres, M., Ameer, W. & Xu, H. (2018). The impact of institutional quality on foreign direct investment inflows: evidence for developed and developing countries. *Econ Res* 31(1):626–644

Peter N. G. & Andrew W. K. (2023). Foreign capital flow, institutional quality and human capital development in sub-Saharan Africa, *Cogent Economics & Finance*, 11:1, 2162689, DOI: 10.1080/23322039.2022.2162689

Preethu R., Zhihe, Z. & Mohammad, M. (2023). Do technological innovation, foreign investment, trade and human capital have a symmetric effect on economic growth? Novel dynamic ARDL simulation study on Bangladesh. *Economic Change and Restructuring* (2023) 56:1327–1366. https://doi.org/10.1007/s10644-022-09478-1

Rizvanolli, A. (2012). The effect of human capital on foreign direct investment: a meta-regression analysis. *Riinvest Institute/AAB-Riinvest University conference "Activating Sources of Economic Growth in Kosovo"* (pp. 1-30).

Sachs J.; Schmidt-Traub G.; Kroll C.; Lafortune G.; Fuller G.; Woelm F. The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020; Cambridge University Press: Cambridge, UK, 2020.

Staniek, Z. (2023). Institution as a factor in sustainable development. *Journal of Sustainable Development of Transport and Logistics. 8(2). pp. 195 – 208. https://jsdtl.sciview.net . doi:10.14254/jsdtl.2023.8-2.14*

Ullah, I. & Khan, M. A. (2017). Institutional quality and foreign direct investment inflows: evidence from Asian countries. *J Econ*

UNCTAD (2020). World Investment Report. New York: United Nations.

Vrinda, G. (2017). Exploring the relation between human capital and foreign direct investment -Indian context. *The Journal of Industrial Statistics*, 6 (1), 89 - 107

Zhang, K. H. & Markusen, J. R. (1999). Vertical multinationals and host-country characteristics", *Journal of Economic Development*, 59, 233-252.

Zhang, K. H., & James, R. Markusen. (1993). Vertical multinationals and host–country characteristics."*Journal of Development Economics* , 59(3), 233-252.

Zhuang J., Dios E., & Lagman-Martin, A. (2017) Governance and Institutional Quality and the Links with Economic Growth and Income Inequality: With Special Reference to Developing Asia. *ADB Economics Working Paper*, Series No. 193.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ANALYSIS OF FACTORS INFLUENCING YOUTH PARTICIPATION IN AGRICULTURAL EXTENSION PROGRAMMES IN LOKOJA LOCAL GOVERNMENT AREA OF KOGI STATE, NIGERIA

Nda Mundi
Department of Agricultural Economics and Extension, National Open University of Nigeria, Kaduna Campus.
Email: nmundi@noun.edu.ng, Phone No: 07061285544

ABSTRACT
The study analyzed factors influencing youth participation in Agricultural Extension programmes in Lokoja Local Government Area of Kogi State, Nigeria. Multi-Stage random sampling technique was used to select 120 respondents. Descriptive Statistics were employed for data analysis. The result on extension contact revealed that (58.3 %) of the respondents already had extension contact. The result also showed that (50.8 %) of the respondents did not have access to credit facilities, this implies that they sourced their credit for farming business from personal savings. The result further showed that majority (44.2 %) of the respondents Participated in "You Win" programme, (30.8% and 12.5%) participated in Young Farmer Club, NYSC Agricultural Scheme and Fadama 111 respectively. On reasons for participation in Agricultural Extension programmes (AEP) result of the study revealed that, 36.7 % of the respondents participated in AEP for increased productivity. The result on constraints revealed that 44.6% of the respondents acknowledged lack of finance as the major constraint that militates against participation in AEP. It was recommended that government should motivate youths' participation by giving incentive, certificate of merits and access to credit to attract more youth into agriculture.

Keywords: *Agriculture, Extension Programmes, participation, Youth*

1.0 INTRODUCTION
Youth is a state of being young and is a transitional period in personality development that bridge the years between childhood and adulthood. According to (Ajayi, 2018) youth is defined as a person who is not yet married and depends on the parents for social and economic survival. Most religious organizations classify youths as people between age range of 15 – 40 years in respective of marital status and means of livelihood. Rural youth in agriculture extension programmes are devised as a strategy for introducing new ideas, new farming methods and technologies into rural life through educational process in order to improve their production efficiency and increase income (Oladele, 2020). More than 74 countries have organized rural youth extension programmes with more than 364, 000 clubs such as tree clubs, horticultural clubs, crop clubs. Young farmers club and others having a total membership of nearly eight and three quarter million people (Maunder, 2016 and Lindley, 2019). "Participation" has been widely used and promoted in developing programmes. Abilo (2015) defined "participation" as a direct involvement of marginalized group in a development process which aims to build one's capacities to have access to and control of resources, benefits and opportunities towards self-reliance and an improve quality of life.

For agriculture to regain its past glory, it is necessary to develop agricultural programmes for the young ones because they are future progressive farmers (Ajala, 2016). The involvement of these young ones that have leadership potentials in agriculture means finding a base for solid and better agricultural technology transfer and better relationship between farmers and agricultural extension workers. The youths form 40% of a community and because of their exposure to vocational agriculture and scientific knowledge acquired; they help in the formation of various agricultural clubs, transfer of agricultural technology and adoption of improved practices (Ogunlade, 2009). Youth participation in agriculture is necessary for continuous food production. Youths are predisposed to bringing about new changes for personal, occupational and community development, hence they are innovative proneness. The involvement of youth in agricultural programmes in many developed and developing countries via young farmers clubs have contributed significantly to their agricultural development (Agbamu, 2014).

Despite every effort by Agricultural Development Project (ADP) to increase food production in Kogi State through transfer of new technologies to rural farmers, there is shortage of food in the State. Several authorities have reported that youths who could have been engaged in agriculture are not adequately motivated by the various arms of the government. This investigation will resort to finding the solution to the problems of youths involved in agriculture, taking cognizance of the extension programme, which is the focus of this study. Against this background, the study seeks to: i. Identify

the agricultural extension programmes available for the youth, ii. Determine access of youth to extension contact and credit, iii. Ascertain the reasons/factors for youth participation in Agric extension programme and iv. Identify problems affecting youth's participation in the study area.

2.0 MATERIALS AND METHODS

Population and Sampling Technique

The target population for this study comprised youths from Lokoja Local Government Area (LGA) of Kogi State, Nigeria. Lokoja LGA consists of two (2) blocks (Lokoja and Abugi) and 16 circles. That is Lokoja block has the following eight circles namely; Sarkin Noma, Tajimi, Karara, Owara, Jamata, Crusher, Lokongoma/Gudumo and Barracks/Zango. Abugi block with the following eight circles; Abugi, Mami, Buddon, Eggon, Tsanawa, Kayinko, Ataji and Aginni. From each block, three circles were selected by simple random sampling technique making a total of six circles. From each circle, 20 youths were selected making a total of 120 respondents as sample size for the study.

Sources and Instrument for Data Collection

Primary and secondary sources of data were used for the study. The primary data were collected by the use of structured questionnaires to source for information from the respondents (youths) and the secondary data derived through textbooks, journals, monographs and internet. The instrument was developed, pre- tested and subjected to validity test before being administered.

Validity of the Instrument

Content validity was carried out to ascertain that the instrument measured what it was intended or supposed to measure. A draft questionnaire was given to experts in the field. The items of the questionnaire were therefore reviewed and appropriate items were selected to represent the universe of content of study.

Data Analysis

Quantitative data from the questionnaires were analyzed using descriptive statistics such as frequency distribution, percentages and mean for objectives i – iv.

3.0 RESULTS AND DISCUSSION

Extension Contacts of Youth Respondents

The distribution of youth according to extension contact is shown in Table 1. The result revealed that (58.3 %) of the respondents had extension contact while (41. 7%) of the respondents do not have extension contact in the study area. This implies that youth respondents have already had extension contact. This is contrary to the result of Ananaba (2018), who stated that majority 59.8 %of female cocoyam farmers never had contact with extension agents in Imo State, Nigeria.

Table 1: Distribution of Youths According to Extension Contact

Extension Contact	Frequency	Percentage
Yes	70	53.3
No	50	41.7
Total	120	100

Source: Field Survey data, 2023

Agricultural Extension Programmes Available for Youths

The distribution of youths according to Agricultural Extension Programmes available is presented in Table 2. Results in Table 2 showed that majority (44.2%) of the respondents participated in You Win Programme, 30.8 % participated in Young Farmers Club while 12.5 % of the respondents participated in NYSC Agricultural Scheme and Fadama III respectively. This implies that youths participated in agricultural extension programme available in the study area

Table 2: Distribution of Youths base on Agricultural Extension Programmes

Agric Extension Programmes	Frequency	Percentage
Young farmers Club	37	30.8
You Win	53	44.2
NYSC Agricultural Scheme	15	12.5
Fadama III	15	12.5
Total	120	100

Source: Field Survey data, 2023

Credit Access of Youth Respondents

The distribution of youths according to credit access is presented in Table 3. The result indicated that 49.2 %of the respondents have access to credit facilities while 50.8% had no access to credit facilities indicating that most young farmers in the study are have no access to credit facilities. This meant that they sourced their credit for farming business from personal savings and they were more likely to be serious with their businesses. This result is in agreement with the findings of Onunka and Ejelu (2018) who observed that farmers who sourced for their credit for business from personal savings were likely to be more committed in their business than their counterparts.

Table 3: Distribution of Youths According to Credit Access

Extension Contact	Frequency	Percentage
Yes	59	49.2
No	61	50.8
Total	120	100

Source: Field Survey data, 2023

Reasons for Youth Participation in Agricultural Extension Programmes

Result on Table 4 showed that majority (36.7%) of the respondents participated in Agricultural Extension Programmes due to increased productivity, 35.0%, for the need to become self-reliant and 31.7% for better standard of living while 23.3% were motivated by presence of improved technologies. This implied that youths who participated in agricultural extension programmes do not only have good intuition for credible and productive work but were also, dependent on agriculture as a means of sustenance, improved livelihood and increased productivity in the study area. This is in conformity with the findings of Oladale (2020) who indicated that inclusion of rural youths in agricultural extension programmes are devised as a strategy for introducing new ideas and technologies into rural life in order to improve their production efficiency and increase their income.

Table 4: Distribution of Youths According to their Reasons for Participating in AEPs

Reason for participation	***Frequency**	**Percentage**
Availability of credit/ grant	27	22.5
Availability of inputs	25	20.8
Contact with extension agents	25	20.8
Availability of farm land`	21	17.5
Availability of Cooperative Society	23	19.5
Incentives and motivation	21	17.5
Marketing facilities available	21	17.5
Already known skill	18	15.0
Only available work	4	3.3
The need for self-reliance	42	35.0
As a way of life	9	7.5
For income generation/profit maximization	30	25.0
For increased productivity	44	36.7
Better standard living	38	31.7
Availability of improved technologies	28	23.3

Source: Field Survey data, 2023

* Multiple responses recorded.

Constraints to Youth Participation

The distribution of youths according to constraint to participation in Agricultural Extension Programmes is presented in Table 5. The result indicated that majority (44.6%) of the respondents experienced lack of credit facilities/finance as the major constraints to their participation in Agricultural Extension Programmes while 25.0% had unavailability of extension agents and farm land as their challenges respectively. Furthermore, 23.3% and 22.5% of the respondents mentioned unavailability of inputs and lack of market and marketing facilities as their problems to participation. This implied that youth farmers experienced challenges during participation in Agricultural Extension Programme (AEP)

Table 5: Distribution of Youths According to constraints to participation

Constraints to participation	*Frequency	Percentage
Lack of finance	53	44.6
Unavailability of extension agents	25	25.0
Lack of cooperation by members	26	21.2
Poor leadership`	11	9.2
Lack of incentives	15	12.5
Unavailability of inputs (Agro chemicals)	28	23.3
Problem of mechanization	10	8.3
Lack of market and marketing facilities	27	22.5
Transportation problem	18	15.0
Unavailability of farm land	30	25.0
Lack of skills	12	8.3
Lack of interest	18	15.0
Lack of time	21	17.5
Nature of extension programs	19	15.8

Source: Field Survey data, 2023
* Multiple responses recorded.

4.0 CONCLUSION AND RECOMMENDATIONS

From the findings, the study concludes that "You Win" is among the programmes that youth participated in the study area. Increased productivity and the need for self-reliance were the reasons for youths' participation in agriculture. Findings in this study also revealed that lack of finance among others were the major constraints faced by youths to participation in AEPs. Based on the findings, the following recommendations are made.

- The Government should motivate the extension programmes which youths participate by giving incentives and certificate of merits to attract more youths into agriculture.
- Youth should be given access to credit to procure inputs to enable them concentrate to farm work more seriously.
- There should be existence of tie between the state and local governments on the need to encourage youths through the extension programmes to enable them become self-reliance.

REFERENCES

Abilo, K.S. (2015). Farm experience towards rural development. A conceptual model for rural urban balance in Nigeria in Sustainable Agricultural development principles. A case study in Nigeria Main Scora publishing copy. PP 68 - 70

Agbamu, A.O. (2014). The image of agricultural development programmes among farmers in Nigeria agricultural development Plan of Niger State PP 25 – 28.

Ajala, O.B. (2016). Innovative approaches to rural development in Nigeria. Auto – Century Publishers Ltd. Enugu, Nigeria PP 46 – 51.

Ajayi, P.S. (2018). Youth participation in rural development. A case study of Ogun State, Nigeria. PP 46 – 51.

Ananaba, A.V. (2018). Adoption of sweet Potato (Ipomoes batatas) production technologies in Imo State, Nigeria. *Journal of Agric. & Social Research*. 6(3) 94 - 98

Lindley, N. P. (2019). The role of Land Grant Institute in the global development of youth. *Journal of Agric. Education Publication.* 34(3) 249 – 252

Maunder, E. P. (2016). An overview of Agricultural Mechanization in Contest of Women Participation. Nome magazine, Vol. 12 May, PP 35 – 36.

Ogunlade, C. A. (2009). Enabling Nigeria youths through productive Agribusiness (1): Lagos. The guardian daily News Paper, June, 27th PP 8.

Oladele, S.O. (2020). Rural Youth: A vital but untapped human resources. Proceedings of AERLS National rural youth workshop. *Invited Paper*. PP 48 – 49.

Onuka, A.O. and Ejelu, O. C. (2018). "Rural – urban fertility differentials in western Nigeria" *Population Studies*. 14(3): 112 – 114.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

PRIVATE SECTOR PARTICIPATION IN THE NIGERIA SEAPORTS DEVELOPMENT AND OPERATIONS: A CASE OF ONNE SEAPORT, RIVERS STATE

[1*]Ahmed Adamu & [1]Adamu Umar
[1]Department of Economics, Nile University of Nigeria
[*]ahmed.adamu@nileuniversity.edu.ng

ABSTRACT
Obsolete infrastructure and bureaucratic bottle-necks dominate the Nigerian port environment which compelled the Federal Government to adopt landlord port model in 2006. The objectives of the paper are to assess effects of private sector investment in port infrastructure, number of ships calls, average ships turnaround time, and average ships berth occupancy rates (independent variables) on the traffic volume (dependent variable). The data published by the Nigerian Ports Authority (NPA) and other sources from 1980-2023, that is; the periods from 1980 to 2006 and from 2007 to 2023 as the pre- and post-concession regimes respectively were obtained for analysis. Autoregressive Distributed Lag (ARDL) was used for data analysis and the result indicated that, the independent variables have significantly positive effects on traffic volume. A 1% increase in investments and number of ships calls raised traffic volume by 17% and 3.1% respectively; a 1% improvement on average ship turnaround time berth occupancy raised traffic volume by 37% and13% respectively. The concession has greatly reduced obstacles prohibiting the port productivity prior to concession. This paper recommends that NPA facilitates the process of obtaining permits for port infrastructure development; the navigation channel be a minimum of 18 meters depth to enable Panamax ships berth at the port; policies and operational procedures inimical to ships turnaround time and ships berth occupancy be reviewed or discarded and a single port transaction window be established as obtainable in developed maritime markets to private terminal operator discharge contractual obligations.

Keywords: *Cargo, Concession, Container, Terminal, Throughputs, Traffic*

1.0 INTRODUCTION
The maritime industry plays a key role in international trade of goods and has been adjudged to be the most cost-effective means of shipping containerized items and cargoes over considerable distances (Raymond, 2015). The technological advancements have made the maritime industry a reliable and dependable partner and it is predictable that over 85% of the global trade in goods are seaborne generated through international trade transactions (IMO, 2014). Nigeria has approximately 843 kilometers of coastline, population of over 200 million and the seaports located in the western and eastern maritime domains are essential to the nation's economy for international trade transactions (imports and exports merchandize). According to Mark (2015), Nigeria accounts for 60% of internation trade in goods destined for West and Central African regions and second-largest source of revenue to the Federal Government of Nigeria (FGN).

In most countries, ports facilities were owned and operated by the public sector, owned and operated by private entities, and in some instances a hybrid of public and private sectors. Ports facilities that are publicly owned and operated generally performed sub-optimally with obsolete infrastructure, unwieldy workforce, corrupt practices, container/cargo insecurity, among other challenges while privately developed and managed ports or the hybrid arrangements exhibited appreciable performances in terms of quantity and quality of services (Micheal, 2016). To resolve the challenges identified above, various governments in both developed and developing economies deliberately framed and implement ports reform policies with the sole goal of inculcating a culture of good practices to enhance operational modalities (Jones, 2016).

The FGN, in 2006, reformed the entire nation's seaports system aimed at making the facilities user- and investor-friendly by adopting a landlord port reform model following study recommendations in 2001 by Royal Haskoning of The Netherlands. The landlord system entails public sector retaining ownership of the port assets while the private sector bears investment, market and operations risks. The relationship between the project parties is governed by a concession agreement which spelt out among others things: contractual obligations of each party and concession tenor. The Onne port like any other ports in Nigeria is faced with dwindling financial resources for modernization resulting to high cost of imports and exports, long turnaround times for ships and increased container dwell times and consequently low traffic volume (Mark, 2015). The main objective of the research is to investigate the

impact of private sector performance in Onne port post-concession. The research specific objective is to evaluate the effect of investments in Port infrastructure, number of Ships calls, average Ships turnaround time and average Ships berth occupancy on traffic volume. The study null hypotheses are that the independent variables have no significant effect on the dependent variable post-concession era.

The purpose of this research work is intended to establish the connection between the dependent variable and the independent variables and a quantitative research technique based on ex-post factor research design, a study process that draws on information about actuals already gathered or collated as it offers a procedure of systematic investigations (Omoluabi, 2008). This suggest that the activities under investigation had happened and the data analyzed had been documented appropriately. The choice of data of this approach is justified by the fact that most of the pertinent data for the paper already occurred quantitatively as a time series for which the variables under study cannot be modified. This approach enables the researcher to track variables over a lengthy period.

2.0 LITERATURE REVIEW

The mercantilists of the 16th and 17th centuries proffered the need for collaboration between public and private sectors to promote enterprise development because trade capital needs wide-ranging public policies and programs to deliberately eliminate trade restrictions and to secure the international trade in both goods and services. The public sector was more interested in trade expansion to meet the growing need for revenue to fund public expenditures for various infrastructure needs of the society. The mercantilism key policies focused mainly on supporting expansion of commercial capital for infrastructure development and operations on one hand, and promotion of state-owned enterprises on the other hand. The purpose of the collaboration is for cooperation between the public and private sectors alike to support delivery of public goods and services at cost-effective manner.

The classical liberal economists centered on the social aspects of cooperations between the public and private entities. According to Smith (1776), the founder of the conventional school of political economy assigned to government the role of a guarantee of freedom of action and private ingenuity for self-determining individual agents that create social wealth. Natural agreement which is a system of symmetry i.e., established logically in market economy systems in the absence of any outside interference. Smith further proffered the elimination of government regulation of economic enterprises based on the theory that public policy interference produces a substantial disproportion in the total gains/losses resulting from restrictions in competitive market. The government should be exempted from actions that likely to create inconsistencies (Smith, 1776). According Pigou (1920), proponent of the neo-classical school, proved the impression on a government's role in a market economy. In any business venture, where there is a motive to believe that based on free business activities, the amounts of resources invested will be less than it is necessary in terms of a general welfare growth, there is a reason for public authority to interfere. He demonstrated that the government's role is to co-opt externalities, adjust from implicit to explicit distinction between private and public organizations.

In the General Theory of Employment, Interest and Money which contradicts the classical-economists' perceptions by declining self-regulation for a market economy because there is no involuntary or self-propelled machinery that would guarantee constant development of an economic system or order. The market system on its own is handicapped to regulate the economy, offer full-employment, ensures uninterrupted production and prices for goods and services. He suggested for an active government role through the application of fiscal and monetary policies which would moderate fluctuations in production and prices for goods and services. The efficacy of the public regulation of an economic process depends largely on the disposable for public investment, the realization of full employment, moderating rate of interest (Keynes, 1936). According to Friedrich Hayek (1932), the concept of a spontaneous market order basically rejected any form of government involvement in an economic system. Hayek further stated that the interface of public and private enterprises in market economy should be restricted to institutional performance of public duties, that is, protection of the ordinary social order characterized by liberty of choice, free market competition, development, and monopoly.

Among the theories reviewed so far, Mercantilists theory is adopted it lays the foundation or platform upon which public-private partnership can be fostered based on proved scientific methods regarding the interface between public and private enterprises or entities. The main characteristics of the mercantilists economic policy was purely protection designed to support the growth of private capital for infrastructure development to guarantee the delivery of public services in the most efficient and cost-effective means. The mercantilism encouraged the need for cooperation and coordination between the public and private enterprises to provide the

needed public assets that would warrant delivery of public goods and services.

3.0 METHODOLOGY AND MODEL SPECIFICATION

The data sources for this study were the annual publication of the Nigerian Ports Authority (NPA) for the period 1980 – 2023. Other sources of data were obtained from the National Bureau of Statistics (NBC) including maritime print and electronic media. The sourced data were grouped into five variables, namely: traffic volume treated as the performance indicator or dependent variable. Others are; the investments in port infrastructure, number of ships calls, average ships turnaround time (measured in days) and average ships berth occupancy (measured in percentages), these were treated as the independent variables. The set for the period 1980 to 2006 represented pre-concession regime, when the NPA administered the facility while the data set for the period 2007-2023 represented post-concession regime when the port was being administered by the private partner.

The data obtained from 1980-2023, both the dependent and independent variables were observed throughout a 43-year period.

The research used Autoregressive Distributed Lag (ARDL) modeling technique as described by Perasan et al., (2002) and Toda-Yammato (1995) respectively. The descriptive statistics technique defined the characteristic of the data set such as; measures of central tendency (mean, median, and mode); measures of variability (standard deviation, variance analysis); the minimum and maximum values of variables. Other technique analyses include Stationarity Test (Unit Root), Johansen Cointegration est, Bounds Test, Vector Error Correction Model, Heteroskedasticity Test and Histogram Normality Test. The general form of an ARDL model is described below and EViews used as an analytical tool.

$$\Delta\text{traff} = a_k + \sum {}^{p}{}_{i=1}\, a_1 i \Delta l\text{traff}_{t-i} + \sum {}^{q1}{}_{i=1}\, a_2 i \Delta\text{invest}_{t-i} + \sum {}^{q21}{}_{i=1}\, a_{3i} \Delta\text{nsc}_{t-i} + \sum {}^{q31}{}_{i=1}\, a_{4i} \Delta\text{astat}_{t-i} + + \sum {}^{q41}{}_{i=1}\, a_{5i} \Delta\text{asberth}_{t-i} + \sigma_1 l\text{traff}_{t-1} + \sigma_2 l\text{invest}_{t-1} + \sigma_3 l\text{nsc}_{t-1} + \sigma_4 l\text{astat}_{t-1} + \sigma_5 l\text{asberth}_{t-1} + \varepsilon t \quad 1$$

$$\Delta l\text{traff} = b_n + \sum b_{1i} \Delta l\text{traff}_{t-i} + \sum {}^{q1}{}_{i=1}\, a_2 i \Delta\text{invest}_{t-i} + \sum {}^{q21}{}_{i=1}\, a_{3i} \Delta\text{nsc}_{t-i} + + \sigma_2 l\text{invest}_{t-1} + \sigma_3 l\text{nsc}_{t-1} + \varepsilon t \quad 2$$

Where:

- TRAFF - Traffic Volume (TEUs/Tons
- INVEST - Investments (Properties, Plant and Equipment)
- NSC - Number of Ships Calls
- ASTAT - Average Ship Turnaround Time (measured in days)
- ASBERTH- Average Ship Berth Occupancy Rate (measured in percentage)
- Δ First Difference Operator.
- a_k and b_n represents the constants
- a_i and b_i represents the coefficients of the differenced variables,
- σi and δi represent the coefficients of lagged variables to determine the long-run cointegration.
- The dependent variable is lagged up to p times (the maximum time lag of the dependent variable)
- qs represent the optimal number of lags for the respective exogeneous variables equally referred to as Autoregressive Terms and Distributed Lag Terms.

Research Variables
The Table 1 below describes the research variables.

Table 1: Research Variables Description

1.	Traffic Volume	Traffic refers to the annual volume of containers and Cargoes processed through a port facility for the purpose of imports and exports. The containers are measured in TEUs and cargoes are measured in tons. Cargoes are categorized as bulk, break-bulk, or liquid and referred to as unpackaged commodities transported in specialized ship carriers. The European Maritime Journal 2018, and Denish Marine Transport Journal 2016, respectively defined port traffic as the total throughputs being processed in a port facility.
2.	Investments in Port Infrastructure	These are the immoveable and moveable developments within the port environment. The immovable development includes such physical assets like office buildings, warehouses, staking area, terminal yard, quay wall, etc. The moveable development the acquisition of plant and equipment like vehicles office, roads, rail links, trucks, rich stackers, cranes, and office equipment. The World Bank defined investments in port infrastructure as any assets that adds value to the operational efficiency of the port traffic handling capacity.
3.	Number of Ships Call	This is total number of ships that visit the port facility to loading and unloading containers and cargoes for both imports and exports. The more ships frequent the port facility, the increase traffic volumes of container and cargo traffic. The International Maritime Organization defined ships as the vehicle for transporting container and cargoes within domestic and international maritime environment.
4.	Average Ship Turnaround Time	In the maritime industry, the duration of time between the ship arrival and its departure from a port facility is called “Average Ship Turnaround Time (ASTT)”. The computation of ASTT) is the difference between the arrival date and departure of the ship at a port facility, typically within one month of navigation on the sea and it is a measure the efficiency of port operations. In other words, ship turnaround time = number of days at waiting at port entry channel + number of days at berth. The higher the number of days spent by a ship signified port’s inefficiency and verse versa. The International Maritime Organization defined ship or vessel waiting time as total number of days spent from the days of arrival to port of destination to the day of departing or sailing to the next port of destination.
5.	Average Ship Berth Occupancy	Berth occupancy is defined as cumulated ST (Service Time) divided by total berth hours available for unit time (Formula 5-10) (Thomas et al., 2000). The formula calculates the period when the quay cannot be used in mooring and leaving the quay and the space of the ship’s rope on the quay. The increase in quay occupancy is due to the increase in the number of ships and container and cargo throughputs. Berth occupancy > 70% signified inefficiencies in port operations. Berth occupancy rate <50% signified resource underutilization. Port efficiency is measured between >50% to <70%. The berth occupancy is a key port performance variable. The International Maritime Organization defined ship berth occupancy as the optimal utilization of quay wall facility where the port assets are not underutilized and over-utilized in course of loading and unloading of ships.

Data Presentation and Analyses
This section shows the outcome of the empirical results derived from the previously mentioned methodology and uses ARDL model technique to investigate the effect private sector participation in the development and operations of Onne Port. In accordance with the ARDL techniques, the data series collated were subjected to various steps of econometric analyses including ensuring that one of the variables used were of order I (2) so as not to invalidate the methodology after all. Thereafter, the usual unrestricted Error Correction Model (ECM) with its appropriate lag length ensures that the data remains dynamically stable and serially independent. This is to evidence long run convergence such that the research achieved both the short- and long-runs dynamic and equilibrium effects.

4.0 RESULTS AND DISCUSSION

The results of the analyses were used to validate or refute existing studies. The descriptive statistics showed the sample data's Mean, Medium, Maximum, and Minimum values, Standard Deviation, and the Jarque-Bera Normality Test also referred to as the Goodness-of-Fit Test to verify whether the trial data include skewness and kurtosis, which imply normal distribution. Fitting the panel regression model depends on doing this. Table 2 shows the descriptive statistics of the variables for this research and the Jarque-Bera test for time series data variables was used to assess normality.

Table 2: Result of Descriptive Statistics and Test of Normality

	TRAFF	INVEST	NSC	ASTAT	ASBERTH
Mean	52556295	538.4545	18309835	6.220455	15.87545
Median	20530000	551.0000	19221351	7.500000	16.20000
Maximum	20.0E+08	885.0000	28102724	8.900000	21.10000
Minimum	602000.0	14.00000	150000.0	2.000000	11.46000
Std. Dev.	73735272	194.9148	7010625.	2.546368	3.955169
Skewness	08.85219	-0.467256	-0.585741	-0.653830	0.065465
Kurtosis	2.004176	3.435084	2.875910	1.690907	1.398488
Jarque-Bera	75.64544	1.948121	2.544243	6.276787	4.733638
Probability	00.22771	0.377547	0.280237	0.043352	0.093779
Sum	23.1E+09	23692.00	8.06E+08	273.7000	698.5200
Sum Sq. Dev.	23.4E+17	1633647.	2.11E+15	278.8116	672.6647
Observations	44	44	44	44	44

Source: Author's Computation, May 2024, EViews version 13

The descriptive statistics of the variables are examined in Table 1 above revealed that the Port's traffics were in container and cargoes for both imports and exports respectively. The container traffic is measured in Twenty Equivalent Units (TEUs) and cargoes measured in tons respectively averaged 75.64544 million while the average amount of investments in ports infrastructure was N19.48121 billion, number of ships calls averaged 2.544242, the average ship turnaround time was 6.27 days and average ship berth occupancy 54.7% respectively. This indicated that, the average port traffic volume in Onne Port is low in comparison to other ports' traffic volume within the Central and Western African maritime environments, such as; the Cotonou Port, in Benin Republic, Duala Port, in Cameroun and Port of Abidjan, in Cote d'Ivoire. The low traffic volume could be attributed to the perennial insecurity in the Niger Delta region of Nigeria where the port is situated.

It is observed that the maximum and minimum Port traffic volume stood at 200 million TEUs and 620,000 tons. This is an indication that some of the port traffic volumes were once very low but have drastically picked up, hence, an upward increase in the volume of container and cargo traffics was observed at the port. As indicated in the Table 2, investments in port infrastructure, number of ships calls, average ship turnaround time and average ship berth occupancy returned a mean value of N538.45 million, 180,098 ships, 6.22**%,** and 15.87% respectively. The test for Port traffic and average Ship turnaround time variables produced a p-value less than 5% significance, while Port infrastructure investments, number of Ships calls, and average Ships berth occupancy produced p-value greater than 5%, meaning that the variables are not normally distributed. To address the non-normality observed in the series prior to modeling, the variable natural logarithm transformation was utilized.

Results in Table 3 illustrates the model equation of the Serial Correlation Linear Model test, and from the outcome, the study can reject the Null Hypothesis, which pronounced $\rho p=0$, meaning that ρs in equation is not dissimilar from zero, as such that are all above zero level, and this implied presence of serial correlation in the model. The Breusch-Godfrey Serial Correlation Test of 3.739364 did surpass the critical chi-square value of 0.1542 at degree of freedom of 2 (the number of lags of the error term) and 5% level of significance, and as such that the study accepts the Alternate Hypothesis, and conclude there is autocorrelation of any order. Observing at the Chi-square's p-value of 0.1542, which is above 5% and even 10% level of significance, which implied that the chi-square value was substantial, as such we can confirm acceptance of the Alternate Hypothesis. Parallel decision was made by means of F-statistic. The

coefficients of the lagged error terms were also substantial as their p-values were both above 5% level of significance, which further validates the presence of serial correlation.

Table 3: Breusch-Godfrey Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	1.304640	Prob. F (2,26)	0.2884
Obs*R-squared	3.739364	Prob. Chi-Square (2)	0.1542

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 04/09/24 Time: 23:20
Sample (adjusted): 1983 2023
Included observations: 41 after adjustments
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRAFF (-1)	0.207026	0.251770	0.822283	0.4184
NSC	0.447301	0.914683	0.489023	0.6289
NSC (-1)	-0.829859	1.297740	-0.639465	0.5281
NSC (-2)	0.215679	0.917879	0.234975	0.8161
NSC (-3)	0.020974	0.879011	0.023861	0.9811
INVEST	4213.039	32712.15	0.128791	0.8985
INVEST (-1)	-34104.82	46787.20	-0.728935	0.4726
PATAT	-566232.5	3663980.	-0.154540	0.8784
ASTAT (-1)	212423.6	4218081.	0.050360	0.9602
ASTAT (-2)	3315048.	5000229.	0.662979	0.5132
ASTAT (-3)	1314678.	4250851.	0.309274	0.7596
ASBERTH	-6335163.	38820327	-0.163192	0.8716
C	-16449864	30502704	-0.539292	0.5943
RESID (-1)	-0.170595	0.301893	-0.565084	0.5769
RESID (-2)	-0.423598	0.264103	-1.603910	0.1208

R-squared	0.091204	Mean dependent var	7.45E-09
Adjusted R-squared	-0.398148	S.D. dependent var	14088460
S.E. of regression	16658659	Akaike info criterion	36.37099
Sum squared resid	7.22E+15	Schwarz criterion	36.99791
Log likelihood	-730.6053	Hannan-Quinn criteria	36.59928
F-statistic	0.186377	Durbin-Watson stat	1.816995
Prob(F-statistic)	0.999017		

Source: Author's Computation, May 2024, EViews version 13

The ARDL models were efficient and fit-for-purpose. The first ARDL model specification was found to have serial correlation using the same method. The CUSUM test was also used to test for the stability of the model as depicted in figure 1.

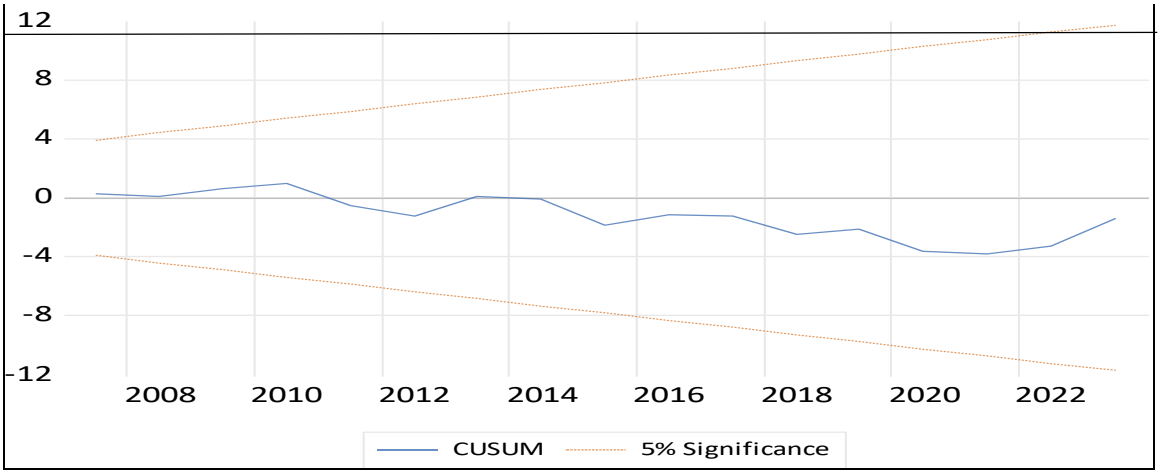


Figure 1: The CUSUM test graph

Source: Author's Computation, May 2024 (EViews version 13)

The Time Plot (Fig.1) showed the trend analysis of the annual data for the port performance indicator (traffic volume) and port performance variables from 1980 – 2023. All the variables appeared to be stable during these times prior to the transfer of port to concessionaires (private terminal operators) through PPP contractual arrangement where investment and operational risks were transferred to the concessionaires. However, from the period 2007 to 2023, there was substantial volatility that is particularly noticeable as the traffic volume started picking up due largely to concessionaires' sound governance, characterized technical expertise, managerial capacity and financial resources deployment designed to enhance port performance. The last quarter of 2019 and the whole of 2020 witnessed drastic drop in port traffic volumes due largely to COVID-19 pandemic that ravaged the entire global supply chain. The recovery process from Covid-19 impact was maintained up and until the year 2021 as evidenced by the sharp decrease in the port traffic volume. As the concession contract governed the relationship between Nigerian Ports Authority and the respective concessionaires, the COVID-19 was treated as Force Majeure which means that none of the parties to the concession contract can be blamed for non-performance that resulted in drastic reduction of traffic volume and accruable revenues to both the concessionaire and Federal Government of Nigeria.

Result in Figure 2 depicts individually, the overall trend of dependent variable (port traffic) and all port performance variables (investments in port infrastructure, number of ships call, average ship turnaround time, and average ship berth occupancy) in the research. There was an observed flat trend in the volume traffic when the port was being managed by the Nigerian Ports Authority (NPA) for the period 1980 to 2006. From the period 2007 to 2009, which was a transition period (the transfer of operation rights to the concessionaires) ports performance dropped as depicted in the chart due largely to scaling down of operations to renovate the port and fixed non-functional plant and equipment. However, immediately after the renovations and fixing of requisite equipment, the port performance picked-up as the port became attractive to shipping companies and import/exports.

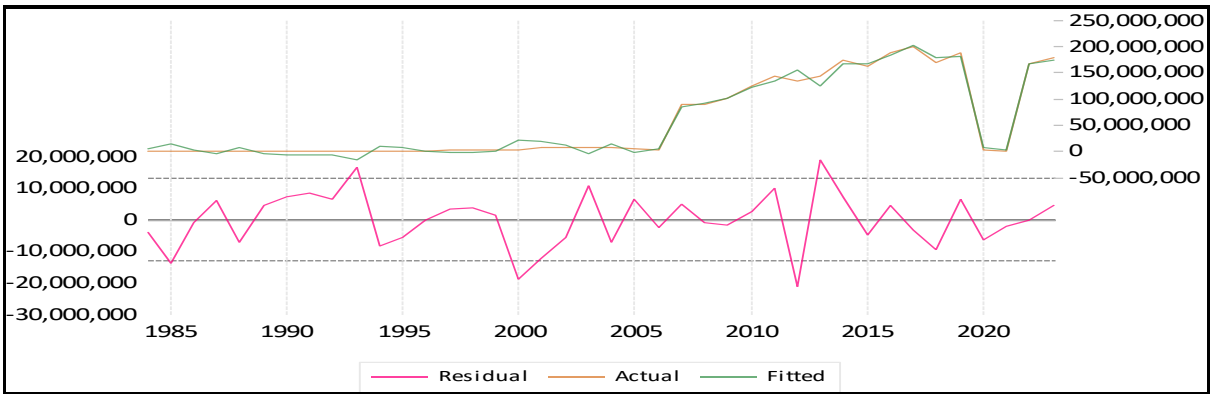


Figure 2: The time plot at level for port traffic volume and port performance variables (1980 – 2023)

The trend pattern observed in investments in port infrastructure during public sector management of the port irregular investment pattern and this can be attributed to the nature of public procurement practices usually constraint by budgetary issues because of enormous competing public needs for goods and services across several segments of the Nigerian economy. In between the period of procuring the private partners (concessionaires) to manage, that is, 2004 to 2006, public investment declined rapidly as the government decided that the port should be transferred to the concessionaires "as is basis" which meant whatever the condition of the port, government was not willing to make any further financial commitments either in renovating port physical infrastructure or procuring new state-of-the-equipment.

However, the period, 2010 to 2015, the concessionaires made significant investments risks as contained the concession agreement signed between the Federal Government and respective port concessionaire worth millions of Naira. The COVID-19 period when the entire global supply chain was frozen due the pandemic, concessionaires' investment witnessed a significant drop but immediately after the pandemic investments by the respective port concessionaires gained considerable momentum. The trend plot for number of ships being attracted to the port was volatile due several factors. First, the public sector investment from the period 1980 to 2006 was slow due to bureaucratic nature of public procurement as it took longer than necessary to fix faulty port assets hence, the non-functionality of port served as disincentive shipping lines and importers and exporters to patronize the port. However, between the period, 2010 to 2015, the port became attractive to shipping lines and importers and exporters alike to the improved quality of port infrastructure and port services as ships line and importers and exporters have limited challenges in obtaining insurance covers for containers and cargoes from insurance companies as port congestion charges were eliminated.

Secondly, then security challenges in the Niger Delta region of Nigeria also posed a considerable challenge to shipping lines, importers and exporters as insurance companies were generally skeptical in insuring ships and cargoes destined for Onne Port during the period 1990-2005. There was a unique trend pattern observed in the average ship turnaround time. From the period 1980 – 2006, the average ship turnaround time was above maritime industry norm of maximum 5-days, any period above 5-days in the maritime domain signified port inefficiencies due largely to the manual nature of port operations as ships must rely on the ships emergency cranes for load and unload containers and equally deploying a Gant of stevedores' loan and unload ships manually which grossly increases the average ship turnaround time. The period between 2010 and 2023, the average ship turnaround time reduced considerably due to respective concessionaires' investments in port infrastructure.

A port is adjudged to be productive or operating optimally when ships spend few days at the port of destination to load and unload containers and cargoes. According to the International Maritime Organization (IMO) Ports Operational Manual, ships should not spend more than 5-days at a port of destination and as at today, the Nigerian ports have achieved this milestone set by the IMO as ships rarely spend more than 5-days not only in Onne port but in other major ports in Nigeria. The port seems to be experiencing a very high ships turnaround time port-concession era because of massive investments in port moveable and immovable assets that warrant speedy discharging of ships as they arrive berth for the loading and unloading of containers and cargoes. It is worthy to note that in the maritime domain, average ship berth occupancy rate above 70% signified port operational inefficiencies; and 50% to less than 70%

signified efficient port operations while average ship berth occupancy below 50% signified underutilization of port assets. The port-concession era, 2007 to 2023 witnessed a remarkable average ship berth occupancy ranging from greater than 50% and less 70%.

Long Run Impact

The positive and statistically significant relationship between port performance indicators and port traffic volume rate is shown in figure 3 due to positive sign of the investments in ports infrastructure coefficient of 1921463 and the number of ships calls had a positive coefficient of 1837722. However, the average ship turnaround time had negative coefficient of -22498741 and average ship berth occupancy had a positive value of 34971366. According to the estimate persistent 1% increase in average ships turnaround time can result 0.22% decrease in traffic volume being handled at the port facility. This is an indication of presence of resource vulgarity in Nigeria, as increased investments in port infrastructure could possibly hinder traffic volume growth rate. If this is statistically substantial, it could have been in line with theoretical point of view of resource curse theory which states that countries with wealth of resources and relying largely on these properties at the cost of other economic enterprises are likely to have a stationary economic development. The Nigerian economy being largely reliant on importation of essential consumables, from which revenue is supposed to be used to fund national developmental projects and create capital formation, and is likely to be harmfully affected due to the volatility of the international supply chain and mishandling of the revenues.

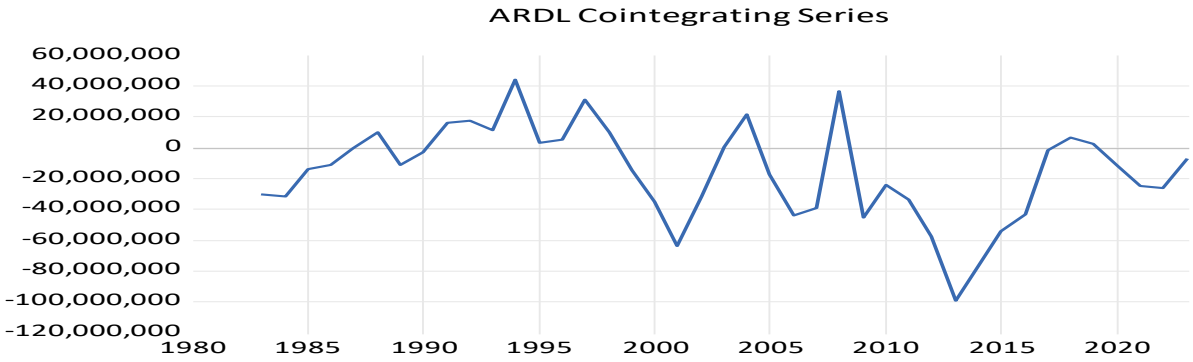


Figure 3: ARDL Cointegration Series

Average ships turnaround time alone may not necessarily precipitate increase in port traffic volume especially if other services of the port are operating optimally. The effect of improvement of average ships turnaround time may not impact port traffic volume growth as the turnaround time may not certainly be translated to enhanced traffic volume growth. However, this negative relationship between average ships turnaround time and traffic volume is not statistically significant in the long run. This finding confirmed the early findings of Albert (1982), who found inverse relationship between traffic volume growth rate and average ships turnaround time. He raised the simple questions of many ports are operating optimally in developed and developing economies. This idea was termed "resource profanity" by Richard (1998), and many studies like that of Hassan et al (2008) and Caroline et al (2010) confirm negative relationship between average ships turnaround time and port traffic volume growth rate. This meant improving ships turnaround time may likely influence the port traffic volume slightly, compared to continuous increase in investments in port infrastructure may have influenced traffic volume growth in Onne port.

4.0 DISCUSSION OF FINDINGS

The result of the ARDL model revealed that investment in port infrastructure has a positive and statistically significant effect on traffic volume. The null hypothesis must be disregarded considering the study outcome. The investment in port infrastructure is significantly impact by establishing traffic volume in Onne port. The finding for hypothesis one agrees with the some reviewed empirical studies. The study agrees with the study of (Richard et al, 2017, Olatunji, 2016; Ahmed et al, 2015) which investigated the impact of private investments in ports infrastructure in 15 Sub-Saharan Africa countries from 1990 – 2010 following ports reform programs in these countries. The outcome of the study highlights the robust role of private sector investments in port development and operations alongside other secondary port productivity measurements such as quality of port services, port community behavior among others. Average investments made by the private terminal operators in each of the ports studied amounts to a minimum of US$500. The ports studies following reform measures include Maputo International Port,

Mozambique; Port of Das-es-Salam, Tanzania; Port of Monrovia, Liberia; Apapa Port, Lagos, Nigeria; and Duala Port, Cameroun, etc. respectively.

The study finding further collaborates with study conducted by Tariq et al., (2015) which examined the relationship between traffic volume and private investments in port infrastructure in Maghreb countries (Sudan, Tunisia, Egypt, Mauritania, and Morocco). The government of these Maghreb nations through concession contracts with a tenor of up to 30-years ships transferred investment obligations to private terminal operators, like AP Moller, Singapore Ports International, etc. Prior to the execution of the concession contracts, these ports suffered from enormous funding challenges due to annual budgetary constraints from their respective governments for port development and transformation, low personnel morales, corruption, and insecurity of containers and cargoes arriving or departing the port facility. The result of the ARDL model for the number of ships calls revealed a positive and statistically significant effect on traffic volume measured in TEUs and tons respectively. The null hypothesis must be ignored considering the study outcome. As result of the modernization of the Onne port infrastructure, more and more shipping line and importers and exporters found the port user friendly as port channel is regularly dredged which enables ocean going vessels or Panama size vessels make regular calls at the Onne port because it is strategically location of the Nigeria's oil and gas industry and core function of the port is the servicing of the oil and gas industry.

Since the port was built in the early 1980s, public sector investment in terms of channel dredging was limited and hampering ocean going vessels to berth at the port but the reform of Nigeria's ports including Onne port witnessed regular dredging of the port channel hence attracting ships to the port for loan and unload containers and cargoes. The outcome of this study agrees with similar study conducted by Andrez et al (1992) on Latin American and Caribbean ports of Argentina, Brazil, Coaster Rica, Ecuador, Guatemala, Trinidad and Tobago on the type and size of ships that patronized these ports post-privatization of the ports in the mid-1980s. The study revealed that the concession of ports in these countries has the improved ships patronages. According to the research findings, the improvement of the navigation channels through private investments which were not easily possible through annual fiscal allocations. In the same vein, similar study was conducted by the Mwanga et al. (2015) for Port of Monrovia, Liberia and the study findings revealed that the transfer of the Port of Mombasa to the private terminal operators (concessions) has scaled-up the number of ships that patronize the port due to regular dredging of the port navigational channel.

The result of the ARDL model for the average ship turnaround time has a positive and statistically significant effect on traffic volume measured in TEUs and tons respectively. The null hypothesis must be rejected considering the study outcome. Following the modernization of the Onne port post-concession, average ship turnaround time has drastically reduced from an average of 21-days to a maximum of 4-days no matter the ship size and the contents to be load or unload. The transfer of the Onne port to private terminal operators (concessionaires) has improved both navigation channel and mooring basin and resulted in the number of days to in and out of the port. Prior to the concession of the port, the port is notorious of congestion due largely to poorly managed navigation channel and mooring basin hence it attracts congestion charges by shipping line to compensate for loss business opportunity while at the port. The outcome of the study come to an agreement with similar study conducted by (Zchoin et al., 1993) on South East Asian ports on average turnaround time for ships in Chinese port.

The result of the ARDL model for shows that the traffic volume growth rate for the period 1980 to 2006 was static owing to long term differed investments in port infrastructure which caused disincentive to shipping lines and importers/exporters alike resulting to long turnaround time for ships for up to 21 days on average which is far above maritime industry average of 4-days maximum. Same disincentive also for ship berth occupancy rate as the average occupancy rate during this period is greater than 70% and signifies port inefficiencies while loading and unloading containers and cargoes. A ship berth occupancy rate of less than 50% signifies under-utilization of ports asset. To make the Nigerian ports competitive and resilient to economic shocks, the Federal Government of Nigeria 2007 concessioned the port to attract private investment and improved port services and thereby relieving the annual funding burden on government. The post-concession era witnessed remarkable improvements in investment in port infrastructure, reduction of average ship turnaround time to a maximum of 4 days and average ship berth occupancy rate was in the region of greater than 50% and less than 70% and was in conformity with the maritime industries practices. The massive investments in port infrastructure have resulted in attracting Panama size vessels as the port's channel was dredged from 8.5 meters to a depth of 11.5 meters through an amortization arrangement as stipulated in the concession contract. Channel obstacles were regularly removed to pave way hitch-free ship navigation which was a major challenge prior to the concession of the port terminals.

The outcome of the research come to an agreement with similar study conducted by Zchoin et al (1993) on South East Asian ports on the impact of private sector participation in development and operations. Andre et al (2014) conducted similar studies on port of Vera-Cruz, Mexico and Port of Quito, Ecuador on the impact of private sector participation in the development and operations of the ports. The result of the ARDL model for the traffic volume growth rate for the period 1980 to 2006 was static owing to long term differed investments in port infrastructure which caused disincentive to shipping lines and importers/exporters alike resulting to long turnaround time for ships for up to 21 days on average which is far above maritime industry average of 4-days maximum. Same disincentive also for ship berth occupancy rate as the average occupancy rate during this period is greater than 70% and signifies port inefficiencies while loading and unloading containers and cargoes. A ship berth occupancy rate of less than 50% signifies under-utilization of ports asset.

To make the Nigerian ports competitive and resilient to economic shocks, the Federal Government of Nigeria 2007 concessioned the port to attract private investment and improved port services and thereby relieving the annual funding burden on government. The post-concession era witnessed remarkable improvements in investment in port infrastructure, reduction of average ship turnaround time to a maximum of 4 days and average ship berth occupancy rate was in the region of greater than 50% and less than 70% and was in conformity with the maritime industries practices. The massive investments in port infrastructure have resulted in attracting Panama size vessels as the port's channel was dredged from 8.5 meters to a depth of 11.5 meters through an amortization arrangement as stipulated in the concession contract. Channel obstacles were regularly removed to pave way hitch-free ship navigation which was a major challenge prior to the concession of the port terminals.

The outcome of the research come to an agreement with similar study conducted by Zchoin et al (1993) on South East Asian ports on the impact of private sector participation in development and operations. Andre et al (2014) conducted similar studies on port of Vera-Cruz, Mexico and Port of Quito, Ecuador on the impact of private sector participation in the development and operations of the ports. Evidentially, the Onne port under the private sector governance structure has witnessed improved volume of traffic being handled in terms of container TEUs and cargo throughputs by more than 68%. The steady improvements in traffic volume which is a primary measure of port performance was largely due to enormous financial investments in ports infrastructure for both moveable and immoveable assets. Ocean-going vessels such as the Panama size vessels now patronizes the port because of the widening and deepening of the navigation channel from 8.5 meters to 11.5 meters and prompt removal of channels obstacles which enables free navigational maneuvers.

The average ship turnaround time decreased from an average of 21 days to maximum of 4-days for all sizes of vessel and thereby reducing ship overhead costs from the date of arrival to the date of departure by an average of 20%. The port now operates optimally within the region of greater than 50% to less than 70% as ship berthing less than 50% signifies under-utilization of port assets while berth occupancy greater than 70% signifies port inefficiency in operations. The port performance pre-concession regime revealed a negative productivity for the period 1980 to 2006 with traffic below 20 million metric tons while the period 2007 to 2023 third quarter witnessed a progressive growth in port performance owning to the private sector participation in development and operations of Onne port with traffic above 20 million metric tons. However, the COVID-19 pandemic that crippled the global supply chain has adversely affected the productivity of Onne port and the post-COVID era witnessed a re-pick of the port productivity. The traffic volume forecast is expected to growth to above 30 million metric tons from 2024 to 2034 with upper bound of 75 million metric tons and lower bound of less than 20 million metric tons as depicted in Figure 15 below if everything being equal.

5.0 CONCLUSION

The research examined the effects of investment in ports infrastructure, number of ships calls, average ships turnaround time measured in days, average ships berth occupancy measured in percentages on the port's traffic volume growth. The independent variables, collectively had significant effect on the dependent variable (port's traffic volume growth). The findings of this research, therefore provide insight into the effect traffic volume growth indexes in Onne port. The study concludes that the exogeneous variables combined have positive impact on the port's traffic volume growth in Onne port. A 1% increase or improvement in these exogeneous variables have positive impact on port's traffic volume growth. From the result and subsequent discussions, there is a link between the endogenous variable and the exogeneous variables

In conclusion, for the Onne port to attain the desired level of annual traffic volume, major private sector investments in port infrastructure are required. However, to improve the traffic volume, the quantity and quality of the port infrastructure, average ships turnaround time and average ships berth occupancy must be improved as obtainable in the most efficient port around the globe as

obtainable in the Port of Antwerp, Belgium; Port of Rotterdam, The Netherland; Maputo International Port, Mozambique; Port of Das-as-Salam, Tanzania respectively. Based on the research findings, which established a positive relationship between the dependent variable and independents variables, the research recommends as follows:

a) The Nigerian Ports Authority should support the respective port concessionaires in obtaining requisite permits, licenses, and authorization to accelerate investments in port infrastructure. This would reduce the inherent bureaucracy involved in obtaining such permits and would also serve as an incentive in attracting both local and foreign investors in the modernization of the port. The periodic investments in port infrastructure should be considered a major priority for expanding the existing container and cargo handling capacity and for refurbishment and acquisition of new assets. Government should also extend the Tax credit scheme being implemented in the roads sub-sector to the port sub-sector of the nation's transport industry. Through the tax credit scheme, concessionaire can retain some portion of taxes payable and used such funds to the development of the port.
b) The Nigeria Ports Authority, who as per the concession contract, bears the risk of dredging the port's navigational channel should be carried at agreed intervals to enable safe passage of ships in and out of the port. Obstacles such as fallen containers or other heavy objects along the navigation channel should be removed promptly to enable hitch-free sailing. In the event the Nigerian Ports Authority faces budgetary constraints in dredging or removing obstacles along the navigational channel, the concession contract should be amended to enable the concessionaires undertake such risk and defray their expenses through an amortization arrangement. This will also reduce the costs of container and cargo transshipments as ships can enter and exit the port without the need to stay on the high seas for smaller ships to carry the loads in smaller quantities in and out of the port.
c) The Nigerian Ports Authority should ensure that ships turnaround time conforms with the maritime industry standards or norms which is a maximum of 4-days. This will reduce expenses incurred by shipping lines in maintaining the ships and sailors associated costs and boost traffic volume in the port.
d) The Nigerian Ports Authority as a landlord as well as the technical regulator should ensure that the port immovable assets (quay wall) and moveable assets (equipment) which facilitates the loading and unloading of ships are functioning optimally. This will guarantee optimal ship berth occupancy and thereby reducing port redundancy and inefficient port services delivery to shipping lines, importers, and exporters alike and raising traffic volume growth.
e) The concession contract that governs the relationship between the Nigerian Ports Authority and the respective concessionaires should be amended to be self-regulating through events triggers to reduce bureaucratic bottle-necks associated with concession contract review and its attend effect on cost of doing port business. Self-regulating concession contracts generally reduces the inherent challenging and bureaucracies in administering and monitoring ports concession contracts.

REFERENCES

Ahmed, H. (2015). Consummate precision of strategic management approach on transport logistics and physical distribution for port performance efficiency: A case study of Nigerian Ports. *Journal of Emerging Trends in Economics and Management Sciences*,, 1(2), 96-101.

Akinwale, A. A. (2010). Concession as a catalyst for crisis management in Nigerian Ports. *The African Symposium* (pp. 117-126). Journal of African Educational Research Network, 10 (2).

Anagor, U. (2014). The gains and challenges of port concession in Nigeria. *BusinessDay, Lagos, Nigeria*.

Awam, I. (2014). Analysis of the Impact of Concession on Port Operations: a Focus on Nigerian Seaports. *Journal of the Nigerian Shippers' Council*, 9-12.

Bank, W. (2015). *Infrastructure Country Diagnostic Assessment of Ports in Sub-Saharan Africa*. Washington, DC: World Bank.

Clark, X. D. (2015). Port Efficiency, Maritime Transport Costs and Bilateral Trade. *Journal of Development Economics, 205*, pp. 417-450.

Consultants, O. S. (2015). *Report on Post-concession of Nigerian Seaports.* Lagos: BusinessDay Newspaper .

Hansen, P. (2017, March 15th). Ports and concession in Nigeria is success story. An interview segment. Ships & port,. (2. A. The voice of the maritime. June 29, Interviewer)

Haskoning, R. (2002). *Nigerian Ports Modernization Study.* Amsterdam, The Neitherlands: World Bank.

Idornigie, P. O. (2015). *Designing, negotiating and drafting of contracts*. Retrieved from

http://www.nigerianlwaguru.com/article/commercial%20law.

IMO. (2017). *International Maritime Organisationm (IMO) Annual Report.* Geneva: International Maritime Organisationm.

Jeevan, J. G. (2015). The implications of the growth of port throughput on the port capacity: The case of Malaysian major container seaports. *International Journal of e-Navigation and Maritime Economy, 3rd Edition*, 84-98.

Jones, J. (2016). Port Reforms in Developing Economies: Benefits, Challenges and Way Forward. *World Bank Maritime Journal* , 13-16.

Joseph, L. (2016). Public Enterprises Reforms in Nigeria: Gains and Challenges. *West African Forum on Public Enterprsis Performance: Successes, Challenges and Way Forward*. Accra: Bureau of Public Enterprises, Nigeria.

Kennedy, O. R. (2015). Sea-Port Operational Efficiency: An Evaluation of Five Asian Ports Using Stochastic Frontier Production Model. *Journal of Service Science and Management, 4th ed.*, pp. 381-399.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. Retrieved from . http://cas.umkc.edu/economics/people/facultypages/kregel/courses/econ645/winter2011/generaltheory.pdf .

Mark, D. (2015). Appraising African Seaports Afrter Reforms: A Case of Nigerian Seaports. *World Maritime Journal*, 86-90.

Micheal, S. (2016). Assessment of Public-Private Partnerships in Ports Operation and Management. *International Maritime Journal, Geneva*, 8-11.

Raymond, S. W. (2015). *Emerging Trends in Maritime Transportation.* John Welley.

Smith, A. (1776). *The Wealth of Nations* . Retrieved from https://www.ibiblio.org/ml/libri/s/SmithA_WealthNations_p.pdf.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

EFFECTS OF GLOBALIZATION ON NIGERIA FINANCIAL SECTOR: 1990 - 2022

*[1]Agum Charles & [1]Wilson Daniel Anjola
[1]Department of Economics, Federal University Lafia, Nigeria
*Corresponding Author Email address: agumcharles@gmail.com

ABSTRACT

The study examined the effects of globalization on the financial sector in Nigeria from 1990 to 2022. The data used for this study were sourced from CBN statistical bulletin. Pre-estimation test was carried out on these data using Unit root test to avoid spurious regression results. The independent variables used in this study are gross capital formation and degree of trade openness, while the financial sector development was proxied with the credit to the private sector which is one of the variables used in measuring financial sector deepening in Nigeria. The cointegration test showed that long run relationship exists between globalization and financial sector. The data collected were analyzed using the Autoregressive Distributed Lag (ARDL) test and error correction model approach. Findings from the study showed that 77.83 per cent degree of trade openness at 9.56 and its probability value is 0.0003 and gross capital formation at 8.76 and its probability value is 0.0046 have a significant impact on the financial sector in Nigeria between 1990 and 2022. The study thus recommends that there is need to sustain between financial sector development and Globalization, there is need to adequately deepen the financial system through innovations and effective regulation and supervision, efficient mobilization of funds and making such funds available for productive investment, and improved services. This way the existing connection between the financial system and global financial system will be strengthened.

Keywords: *financial sector development, globalization, gross capital formation and trade openness*

1.0 INTRODUCTION

The World business environment has changed dramatically through the globalization of economies, Regional integration, and removals of trade barriers have shaped the world as a global village (Schmukler and Vesperoni, 2014). The increasing globalization of business, the changing face of global political landscape, increased diffusion of political boundaries and the changing forms of governance structures for international firms motivated by innovations in the information technology necessities the need to focus on how international business firms undertake their business activities abroad (Schmukler, 2017). Globalization can be described as a process of international integration arising from the exchange of world ideas, products views and innovations (Garcia 2022).

The most challenging development in world history today is globalization. Globalization is the increased integration of world economies through trade and capital flows, facilitated by the phenomenal growth in information technology and the opening up of closed economies and societies (Ezike, 2019). The concept of globalization infers that the globe is a single unit which functions as one when it comes to decision-making. In other words, globalization implies the free movement of goods, services and capital throughout the world.

Globalization involves the opening up of national economies to global markets (Rupali, 2018). With the advent of globalization, the world has become a much smaller place where interaction between different countries has led to a situation where a country's economy and development are not only in the hands of the ruling government, but is highly influence by international organizations where international rules and legislations reigns. This naturally and simultaneously results in the simultaneous reduction in the role of the State to shape national policies. Many Socialists define globalization as a primarily economic phenomenon, which involves increasing interaction and integration of national economic systems. This leads in turn to growth in international trade, investment and capital flows. Moreover, there is a rapid increase in cross-border social, cultural and technological exchanges because of the phenomenon of globalization.

The operating environment for commercial banks like any other organizations has become very dynamic. In order to cope with this dynamism, it is important that organizations develop appropriate strategies (Levine, 2021). The financial industry has witnessed increased integration of financial institutions across national borders. The recent deregulation of financial systems, the technological advances in financial services, and the increased diversity in the channels of financial globalization have been witnessed in many financial sectors across different nations. Financial globalization refers to the integration of a country's local financial system with international financial markets and institutions (Frankel, 2010). Integration takes place when liberalized economies experience an increase in cross-country capital movement, including an active participation of local borrowers and lenders in international markets and a widespread use of

international financial intermediaries (Mussa, 2013). This integration typically requires that governments liberalize the domestic financial sector and the capital account.

Globalization affects virtually all the industries and the financial sector is no exception. Economists believe that the inception of the global integrationist means the globalization of financial services. Other elements that contribute to the globalizing of the banking industry are the emergence of new business models, the emergence of global challenges to banking, the changing attitude and perspectives of the workforce and the emergence of new competitors. The most important, however, is the ongoing trend of removing regulatory barriers to international banking. The banking industry in Nigeria, for instance, had been revolutionized by globalization. All the commercial banking businesses in Nigeria are privately owned, and globalization advent affects these commercial banks. The globalization of Nigerian banks was facilitated by the advancement of Information and Communication Technology (ICT). Since there are also risks, the Nigerian government through the Central Bank of Nigeria (CBN) adopted appropriate regulatory, prudential and supervisory framework regarding the banking industry. The recent consolidation of the Nigerian banking system (banking sector reforms) is another aspect of globalization. Adegbaju and Olokoyo (2008) observed that banking reforms have been an ongoing phenomenon around the world right from 1980s, but it became more intensified in recent time because of the impact of globalization which is predicated by continuous integration of the world market and economies.

Over the past few decades, there have been gains and benefits from increased border transaction and massive flow of investment, technology and information between and among countries. Many other countries have however been faced with enormous challenges of partaking in the benefits of globalization. Such challenges include structural deficiencies, inefficient and inappropriate economic policies and high existence of corruption in the country amongst others. All these internal problems reduce their strength and capacity to successfully compete in the global trend rather they tend to reap the negative effects of globalization. Globalization has largely been driven by the interests and needs of the developed world that have access to the markets of developing countries. However, developing countries have a major problem accessing the markets of developed countries many tariffs and non-tariffs barriers in developed countries have continued to hinder exports from developing countries (Obadan, 2018). This problem however lies beyond the control of developing countries. Also with increased dependence of nations, most developing countries have been exposed to external shocks and crises and these economic crises tend to exist much longer in the developing countries due to the unwary and unstable nature of their economy

2.0 LITERATURE REVIEWS

Conceptua1 Review

Globa1ization

G1obaliation refers to the process of the intensification of economic, political, social and cultural relations across international boundaries. According to Fafawara (1998), globalization is the increasing breakdown of trade barriers and the increasing integration of world market. Globalization is also seen as a process which makes possible free movement of goods and services, capital flows, information and ideas flow as well as people across national borders, result in in greater integration of world economies (Okey 2004). Ajayi (2001), define globalization as the increasing interaction and integration of the activities of human societies around the world. Ajayi further analyzed this definition to have both a description and prescription. The description refers to the expansion of international flows trade, finance and information into an integrated global market.

The prescription refers to the liberalization of national and global markets in the belief that free flow of finance, trade and information will produce the best outcome for both economic growth and human welfare. Globalization connotes the rapid expansion through giant multinational companies of capitalism and their “blood sapping principles” of “liberalization”, “commercialization”, “privatization” and “undemocratic property’-based democratization” to several areas of the world including were it had hitherto been resisted or put in check (Madunagu, 1999). In other words, globalization which is an “imperial policy” (Toyo, 2004) and the “final conquest of capital over the rest of the world”, is deeply rooted in history and quite explainable within the context of the o -arm banditry and exploitive antecedents of capitalism which by its nature cannot exist without parasitic expansion (Tamuno, 2006).

There is no doubt whatsoever that, the concept of globalization is multifaceted. Consequently, for the purpose of this study globalization is seen as opening an economy without barriers for free movement of goods and services and capital flows resulting into greater integration of world economies. Degree of openness is taken as a proxy of globalization. It measures the extent to which an economy is open to the world. In this study, it is seen as trade openness therefore, it is the ratio of total trade to gross domestic product. Gross capital formation refers to that part of a country’s resources that are diverted from current consumption needs which re saved for further investment. Portfolio investments are

investments made by foreigners through the purchase of referred to capital flows from abroad. Market capitalization is used in the study as the size of the

Financial Sector

A financial system has been defined as a complex of various institutions, and operators that interact' within an economy to provide financial services. Such services according to Gbosi, (1993) may include "resource mobilization and allocation, financial intermediation and facilitation of foreign exchange transactions to enhance international trade". The financial sector, thus, plays important roles in the process of economic growth and development of a country. In the Nigerian economy, the financial sector encompasses financial instrument, financial markets and the financial institutions. Usually, the financial instruments are traded in the financial market by the financial institutions. The financial sector collects savings and lend these funds to the deficit pending unit. This shows that the financial sector is a catalyst in the whole process of economic growth and development. In Nigeria, the financial sector has undergone remarkable changes in terms of ownership structure, the depth and breadth of instruments established the economic environment and the regulatory framework within which the sector operates. The Nigerian financial sector can be grouped into two main classes namely the non-bank (traditional) financial sub-sector and bank (modern) financial sub-sector.

Theoretical Framework

Development Theory of Globalization

The development theory emerges from the global mechanisms of greater integration with particular emphasis on the sphere of communications and economic transactions. In this sense, the perspective is similar to the world systems approach. However, are one of the most important characteristics of globalization process position is its focus and emphasis on cultural aspects and their communications worldwide (Tomlinson, 1999). In addition to the technological, financial and political ties, globalization scholars argue that modern elements for development the interpretation are the cultural and economic links among nations. In this cultural communication, one of the most important factors is the increasing flexibility of technology to connect people around the world (Kaplan ,1993, Gough ,1992).

As we have already noted, a particular feature of Globalization is the momentum and power of the change involved. It is the interaction of extraordinary technological innovation combined with world – wide, reach that gives today's change its particular completion (Hullon & Giddens, 2001). Developments in the life sciences and in digital technology and the like have opened up vast, new possibilities for production and exchange. Innovation like the internet has made it possible to access information and resources across the world and to coordinate activities in real time. Earlier, we saw Castells making the point that productivity and competitiveness are by and large a function of knowledge generation and information processing. For countries in the vanguard of the world economy, the balance between knowledge and resources have switched so far towards the former that knowledge has become perhaps the most important factor determining the standard of living – more than land , than tools and then labour. Today's most technologically advanced economies are truly knowledge based (World Bank, 2015).

Empirical Review

Samuel and Chris (2022) examined the relationship between globalization and the performance of the Nigerian financial sector. Assets of the Nigerian financial sector were used as performance indicators of the Nigerian financial sector. The data used are Nigerian yearly data from 1985 to 2018. The data were analyzed using OLS statistical technique, Johansen's co-integration and error correction mechanism. Samuel et al (2022) equal adopted Augmented Dickey-Fuller statistics to test for stationarity. Globalization variables are: degree of openness, foreign direct investment, and portfolio investment flows, external debt flows, nominal exchange rate and gross capital formation. The results showed that the Nigerian financial sector had a positive relationship with globalization but this was statistically not significant. It was therefore recommended that for the Nigerian financial sector to optimally benefit from globalization, the recent bank re-capitalization and debt recovery exercise and monitoring of macroeconomic stability should be encouraged to gain confidence by investors in the financial sector.

According to Omojolaibi, Ekundayo, Nsofor (2021) the concept globalization is a very recent term only establishing its current meaning in the 1970s. They investigated the channels through which globalization affects Financial Sector Performance in Nigeria. To this end this study examines the data for these variables used in this study for the period (1987-2014). The results obtained in this study have established that globalization has a significant effect on Financial Sector Performance in Nigeria. Higher pace of globalization is found to be associated with a good financial system in Nigeria and it also serves as a stimulant for the economy. The study calls for an enabling environment for the financial system as well as interest rate targeting to encourage more financial in-flow.

Ekong (2018) carried out an empirically investigation on the effect of globalization on commercial banks performance in Nigeria in the period from 1980 to 2013 using Error Correction Mechanism (ECM). His study was motivated by the observed falling financial assistance to the economy by commercial banks even in the face of growing global participation. The result showed that a positive effect of globalization on improving performance of commercial banks in Nigeria will only occur at the price of time. Stated specifically, a percentage increase in participation in globalization will improve Nigerian commercial banks' ability to extend credit to the private sector by 10 percentage points and above as time passes. The study recommended improvement in local content policies in prioritized sectors of the economy to shorten the time-cost and reverse the trend.

To investigate the effect of globalization in the Nigerian commercial banks, Osamor, *et al.*, (2013) applied panel regression on panel data from Nigerian commercial banks from 2005 to 2010 to examine their performance. The period conforms to the banking sector reforms of consolidation and further liberalization of the sector. The study reveals that foreign private investment, foreign trade and exchange rate (proxies for globalization) positively and significantly affected the profit after tax of Nigerian commercial banks, but the magnitude of such effect was indeterminable due to variations on data for performance measure of the banks under study. To investigate the impact of globalization in developing countries, with special reference to the financial sector in India, Goyal (2006) carried out a study and he discovered that globalization in India had a favourable impact on the banking industry and overall growth rate of the economy. The growth rate was as low as 3 per cent in 1970, but almost doubled to 5.9 per cent in the eighties as a result of globalization. Modolaji & Ndako (2008) examined the impact of globalization on the Nigerian financial sector. They focused their research into the role globalization plays in Nigeria's financial sector. It was observed in the study that globalization has enhanced Nigeria's growth process and has offered several benefits to the economy. It therefore suggested that for the country to reap more benefits of globalization, a minimum threshold of development of necessary institutions is required.

Basco (2014) developed an empirical dot-com model in analyzing the relationship between globalization and Financial Sector Performance. It was observed that as globalization increases, the tendency for a financially developed country to have bubbles also increases. The reason given is that under autarky, rational bubbles can only surface in the presence of assets shortage which is only associated with a financially constrained country and that with an integrated economy, excess demand for assets at the global level can also trigger rational bubbles. In conclusion, the study suggests that globalization enables highly financially underdeveloped countries to access international capital markets thereby making the global economy financially constrained and stimulating the prospects for rational bubbles. De Nicolo & Juvenal (2014) focused their study on measures of financial integration as well as globalization has on real activities in some advanced and emerging economies between 1985 and 2008. The study which employed a dynamic panel analysis and focusing on three dimensions of real activity which include measures of macroeconomic instability, growth volatility and growth itself observed that globalization and financial integration are associated with lower growth volatility, higher growth and lower possibilities of declines in real activity. It did not however find any evidence of a trade-off among globalization, macroeconomic stability, growth and financial integration.

3.0 METHODOLOGY

This study employed expo factor research design was used to analyze the trend and flows of the variables. Data to be used for this research consist mainly of secondary data which are relevant to the study and were obtained from published sources which include CBN publications, CBN statistical bulletin, journals and National Bureau of Statistics (NBS). Ordinary least square statistical technique is adopted because it is simple and gives the best linear unbiased estimates. Co-integration and error correction techniques are also used to estimate the models. This is because most economic time series data that exhibit strong trends are non-stationary and may lead to spurious relationship.

Model Specification

In line with the extant literature Samuel and Chris (2022), this study used Trade Openness (TO) and Gross Capital Formation (GCF), as the explanatory variables while Financial Sector Development (FSD) is measured by Credit to Private Sector (CPS) as a ratio of Gross Domestic Product (GDP). Credit to Private Sector is one of the indicators of financial deepening. This work is similar to the works of Samuel and Chris (2013) who examined the relationship between globalization and the performance of the Nigerian financial sector. A model is therefore formulated to determine the impact of Globalization on the Financial Sector Development in Nigeria.

The implicit model specifications here are formulated to tests the hypotheses that were stated in chapter one:

$$FSD = f(DTO, \mathrm{GCF}) \quad (1)$$

Setting up equation (1) in a linear stochastic form (or econometric form), the study obtains:

$$FSD = \beta_0 + \beta_1 DTO + \beta_2 GCF + \mu_{1t} \quad (2)$$

Where

β_0 = intercept or independent parameter estimate.

β_1 - β_4 = the slope of the coefficients of foreign direct investment, degree of trade openness gross capital formation, and Exchange rate.

FSD = Financial Sector Development
DTO = Degree of trade openness
GCF = Gross Capital Formation
μ = Error term (or stochastic term).

***Apriori* Sign Expectation**

We then differentiate partially with respect to of each variable to obtain ***apriori*** sign expectation of equation (2);

$$\frac{\partial FSD}{\partial DTO} = \beta_1 > 0 \quad (4)$$

$$\frac{\partial FSD}{\partial GCF} = \beta_2 > 0 \quad (5)$$

On the *apriori* expectations, positive β_1 and β_2 depicts a direct (or positive) relationship between FSD, DTO and GCF. It shows that on *apriori* basis, the FSD increases due to an increase in independent variables.

4.0 DATA ANALYSIS

Descriptive Statistics

The descriptive statistics of the data collected for the study is presented in Table 4.1

Table 1: Basic Descriptive Statistics Relating to the FSD (measured by credit to private sector CPS), DTO and GCF.

	CPS	DTO	GCF
Mean	7.287323	13.51197	11.16890
Median	7.496365	12.79788	12.08873
Maximum	9.596222	16.33773	13.25284
Minimum	3.687205	11.13338	7.021611
Std. Dev.	1.832657	1.925374	2.072814
Skewness	-0.4998	0.250590	-0.82734
Kurtosis	2.004366	1.399811	2.083189
Jarque-Bera	2.405175	3.397574	4.324066
Probability	0.003416	0.012905	0.012091
Sum	211.3324	391.8471	323.8982
Sum Sq. Dev.	94.04166	103.7979	120.3036
Observations	32	32	32

Source: ***Computed by the Author 2024, using E-views 10***

Table 1 indicated that the credit to private sector (CPS) in Nigeria during the period of 28 years (1990-2022) had minimum and maximum values of 3.68% and 9.59% respectively. The average value of the CPS during the period was 7.28% with standard deviation of 1.83%, implying that the data deviated from the both sides of mean by 5.45%. This suggested that the data for the CPS was not widely dispersed during the sample period, because the standard deviation was less than the mean value. The coefficient of skewness of -0.49 suggested that the data was negatively skewed and did comply with the symmetrical distribution assumption. However, the probability value of Jaque-bera of 0.003 also implied that the Gausian distribution assumption of normal data had been met.

Table 1 also showed that the Degree of Trade Openness (DTO) during the period had minimum and maximum values of 11.13 % and 16.33% respectively. The average amount of loans by DTO during the period was 13.51 % (which was relatively high) with standard deviation of 1.92%, implying that the data deviated from both sides of mean by 11.59%. This suggested that the data from the DTO variable was not widely dispersed from the mean during the sample period, as the standard deviation was found to be low. The coefficient of skewness of 0.25 suggested that the data was positively skewed and had not complied with the symmetrical distribution assumption. However, the p-value of 0.01 for Jarque-Bera on the other hand implied that the Gausian distribution assumption of normal data was also met.

Finally, Gross Capita Formation (GCF) during the period had minimum and maximum values of 7.02% and 13.25% respectively. The average amount of government expenditures during the period was 11.16% with standard deviation of 2.07%, implying that the data deviated from both sides of mean by 9.09%. This suggested that the data from the governments

expenditure on agriculture was not widely dispersed from the mean during the sample period, as the standard deviation was found to be low. The coefficient of skewness of -0.82 suggested that the data was negatively skewed and had complied with the symmetrical distribution assumption. However, the p-value of 0.012 for Jarque-Bera on the other hand implied that the Gausian distribution assumption of normal data was met.

Summary of Unit Root Test Results

Table 2: Unit Root Test

Variable	Order of Integration	ADF Test Statistics	Critical ADF Test Statistics
CPS	I(0)	-4.547407	(-4.339330)*
DTO	I(0)	-5.301721	(-4.323979)*
GCF	I(1)	-5.593788	(-4.339330)*

Source: Authors Computation, 2024 (Eview-10): Note: MacKinnon critical values for the rejection of hypotheses of unit root are in parenthesis in Columns 1 and 2 and the tests included intercept with trend; * *significant at 1%; ** significant at 5%; *** significant at 10; Mackinnon critical*

their ADF test statistics -5.301721 and -4.547407 are greater than their critical test statistics of (-4.323979) and (-4.339330) at 1% significant level respectively.

The result however showed that Gross Capital Formation (GCF) and Degree of Trade Openness (DTO) were all stationary at first difference. Since all the variables were found to be stationary at different orders, it was safe and the study employ bound test approach to validate or test for the presence of Co-integration.

Table 3: Result of Cointegration Test

Date: 04/24/19 Time: 21:05
Sample: 1990 2018
Included observations: 28
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	5.724511	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

From table 4.3, it could be observed that all the variables were found stationary at levels, that is they were integrated at order zero {I(0)}. However, CPS (which is found stationary at levels) were found to be stationary at 1% level of significance. At this order of integration,

Table 3 presented the result of the Co-integration test. The result revealed that there was an existence of co-integration among the variables. The f-statistics value of 5.724 was greater than the lower and upper bound values at 5% and 10% level of significance. Hence, there was a sufficient proof of the existence of a long-run equilibrium relationship between Globalization and Financial Sector Development which is measured by the ratio of credit to the private sector as a percentage of GDP in Nigeria between 1990 and 2022. The result thus showed that Globalization had long run sustainability on financial sector development within the period under study.

Estimation of Results

The error correction mechanism result is presented in

Table 4.

Table 4: Selected Model: ARDL (1,0,0,0) ECM Results: Dep.Var: CPS

Variable	Coefficient	t-Statistic	Prob.*
CPS (-1)	0.332219***	1.924533	0.0638
DLOG(CPS(-1))	0.524121*	2.52411	0.0024
LOG(DTO)	4.196859**	1.982163	0.0241
DLOG(DTO(-1))	4.021741**	2.214001	0.0358
LOG(GCF)	3.870779	1.670741	0.5075
DLOG(GCF(-1))	3.254710	2.845109	0.2511
ECT(-1)	-0.667781*	-4.427661	0.0001
C	-1.437041	-0.411822	0.6834
R-squared	0.778333		
Adjusted R-squared	0.695444		
F-statistic	4.564329		
Prob(F-statistic)	0.005343		
Durbin-Watson stat	1.801323		

Notes: ****, ** and * indicate statistical significance at 10%, 5% and 1% levels, respectively*

Source: Authors computations (2024), using Eviews-10

From the regression results, it is glaring that the lagged error correction mechanism is negative, less than unity and statistically significant at 5 percent. The state value of coefficient revealed that once there is disequilibrium in the system, it takes an average (high) speed of 66.77% to adjust itself back towards long-run equilibrium level. This finding was collaborated the fact that a highly significant lagged error correction terms proves the existence of long-run relationship between the variables and its ability to adjust from dis-equilibrium state towards equilibrium level.

The F-statistics which is used to examine the overall significance of regression model revealed that the result is significant, as indicated by the value of the *F*-statistic, 4.56, which is significant at the 5.0 per cent level. That is, the F-statistic P-value of 0.000 is less than 0.05.

The R^2 (R-square) value of 0.7783 revealed that the independent variables in the model have a good impact on financial sector development in Nigeria which is measured by the ratio of credit to the private sector as a percentage of GDP. It indicates that about 77.83 per cent of the variation in financial sector development is explained by the independent variables which include degree of trade openness and gross capital formation, while the remaining unaccounted variation of 22.17 percent is captured by the white noise error term.

It was used to test for the presence of serial correlation or autocorrelation among the error terms. The acceptable Durbin – Watson range is between 0 and 2.4. The model also indicates that there is no autocorrelation among the variables as indicated by Durbin Watson (DW) statistic of 1.80. This demonstrates that the estimates are unbiased and can be relied upon for economic decisions.

Test of Hypotheses

$H0_1$: Degree of Trade Openness has no significant impact on the financial sector development in Nigeria

Table 5: Results of Wald Test on Degree of Trade Openness and Financial Sector Development in Nigeria

Test Statistic	Value	Df	Probability
F-statistic	9.56411	(3, 8)	0.0003
Chi-square	5.214511	4	0.0241

Source: Authors Computation, 2024 (Eviews-10)

The Wald-test in table 5, indicate that the calculated F-value for Degree of Trade Openness was found to be 9.56 and its probability value is 0.0003. Since the probability value is less than 0.05 or 5percent level of significance, which fell in the rejection region and hence, we rejected the second null hypothesis **(H_{01})** and conclude that Degree of Trade Openness has an impact on the financial sector Development in Nigeria.

$H0_2$: Gross Capital Formation has not significantly influenced the financial sector development in Nigeria.

Table 6: Results of Wald Test on Gross Capital Formation and Financial Sector Development in Nigeria

Test Statistic	Value	Df	Probability
F-statistic	8.76411	(3, 8)	0.0046
Chi-square	5.11231	4	0.0232

Source: Authors Computation, 2024 (Eviews-10)

The Wald-test in table 6, indicate that the calculated F-value for Gross Capital Formation was found to be 8.76 and its probability value is 0.0046. Since the probability value is less than 0.05 or 5percent level of significance, which fell in the rejection region and hence, we rejected the second null hypothesis **($H0_2$)** and conclude that Gross Capital Formation has an impact on the Financial sector Development in Nigeria.

4.0 DISCUSSION OF FINDINGS

Findings from the study showed that Degree of Trade Openness and Gross Capital Formation were found to be positive and significant in the study implying that TO has positive influence on the financial sector. This research finding is similar to that of Samuel and Chris (2022) who examined the relationship between globalization and the performance of the Nigerian financial sector. Assets of the Nigerian financial sector were used as performance indicators of the Nigerian financial sector. . This result confirms most findings in many empirical studies in the literature. Specifically, it concurs with a study by Seetanah et al. (2010) who found a positive effect of trade openness on financial development for Mauritius. Huang and Temple (2005) also investigated the effect of trade openness on financial development for 88 countries and found statistically positive effect of trade openness on financial development in the long-run for lower-income group like Pakistan and Vietnam. Benyah (2010) who investigated what determines financial intermediary development in all African countries, by making use of cross sectional data and panel data techniques, for the period of 1975-2006. His cross sectional regression results showed that there is a positive relationship between trade openness and financial intermediary development. His findings further showed that GDP growth rate and financial openness however are not statistically significant in explaining financial intermediary development. Panel regression results also showed trade openness is important in explaining financial intermediary development, and financial openness negatively influences financial development. Rajan and Zingales (2003) argued that simultaneous opening of both trade and capital account hold is the key to successful financial development. Opening trade and capital account not only fosters competition and reduces inefficiencies, but might also give incumbents new opportunities that will bring them even higher profits to cover any negative effect from higher competition. The function thus shows that a 1percent change in degree of trade openness, on the average, retarded financial sector development by -12.41% between 1990 and 2018.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings and summary of findings above it can be confidently said that opening the Nigerian financial sector to the world has done it better than harm. Globalization has enhanced standardization in the operations of the financial institutions in Nigeria as it was able to exchange best practices with international partners which have led to a reduction of costs and improved financial performance

The study recommends that appropriate policy measures should be adopted to ensure a profitable financial integration hence development of the financial sector in Nigerian. Other specific recommendations are made viz:

i. To sustain the existing relationship between financial sector development and Globalization, there is need to adequately deepen the financial system through innovations, adequate and effective regulation and supervision, efficient mobilization of funds and making such funds available for productive investment, and improved services. This way the existing connection between the financial system and global financial system will be strengthened.

ii. To fully realize the growth potentials of the Nigerian financial sector, it is necessary to remove all obstacles that could undermine the growth of credit to the domestic economy. Among other measures, thereby, enhance their ability to extend credit to the economy.

REFERENCES

Adegbaju, A., & Olokoyo, F. (2008). Globalization and banking reforms in Nigeria: An empirical analysis. International Journal of Business and Emerging Markets, 1(2), 195-209.

Ajayi, S. I. (2001), "What Africa Needs to Do to Benefit from Globalization", Finance and Development, IMF, December, Washington DC.

Basco (2014) developed an empirical dot-com model in analyzing the relationship between globalization and Financial Sector Performance

Central Bank of Nigeria (2005), Annual Report and Statement of Accounts

De Nicolo, G., & Juvenal, L. (2014). Financial integration and real activity. Journal of Financial Stability, 11, 1-9.

Ezike, V. O. (2014). Globalization and development: Challenges and opportunities. International Journal of Economic Development Research and Investment, 1(2), 15-28.

Ekong. M. (2018). Globalization and the performance of the commercial banks in Nigeria. Journal of Globalization Studies, Vol. 7 No. 1, May 2018 124–138

Fafawara, O. (1998). Globalization: The breakdown of trade barriers and the increasing integration of world markets. Journal of International Business Studies, 29(4), 759-775

Frankel, J. (2010). Globalization of the Economy. NBER Working Paper No. 7858. Retrieved from https://www.nber.org/papers/w7858.pdf

Garcia, M. (2022). Understanding Globalization: The Social Consequences of Political, Economic, and Environmental Change. Rowman & Littlefield Publishers

Goyal, K. A. 2006. Impact of Globalization on Developing Countries (With Special Reference to India). International Research Journal of Finance and Economics 5: 1450–2887.

Ubosi A. N (1993), Monetary Economics and the Nigerian Financial System, Pam Unique

Garcia, E. D. T. (2012). Financial Globalization and Financial Development in Transition Countries. Economia Teoria Y Practica Nueva Epoca, 36, 155-178 Publishers, Port Harcourt

Gbosi A. N (2007), The Nigerian Economy and Current Economic Reforms, Olorunnishola Publishers, Ibadan

Mobolaji, H. I., & Ndako, U. B. (2008). Financial Development and Globalization in Nigeria. The IUP Journal of Financial Economics, 6(1), 29-45.

Modolaji, M. A., & Ndako, U. B. (2008). The Implications of Globalization for the Nigerian Financial Sector: Some Empirical Insights. African Economic Research Consortium (AERC) Research Paper No. 183, Nairobi, Kenya

Madunagu, E. (1999). Globalization: A Panoramic View. In J. Ikein (Ed.), Issues in Social Sciences: Volume 1 (pp. 59-74). Abuja, Nigeria: NPS Educational Publishers Limited

Mussa, M. (2013). Factors driving global economic integration. Journal of International Money and Finance, 19(2), 185-204. https://doi.org/10.1016/S0261-5606(00)00027-X

Obadan, M. I. (2018). Globalization of Finance and the Challenge of National Financial

Okey O. (2004), "Problems and Prospects of Globalizatin in Developing Countries: The Nigerian Case". An African Journal of Philosophy, Vol. 7, No.lpp.89-96

Osamor, I. P., Akinlabi, H., and Osamor, V. C. 2013. An Empirical Analysis of the Impact of Globalization on Performance of Nigerian Commercial Banks in Post-Consolidation Period. European Journal of Business and Management 5 (5): 38–45.

Omojolaibi, O., Ekundayo, T., & Nsofor, C. (2021). Globalization: Concept and Dimensions. In J. Afolabi & F. Oluleye (Eds.), Globalization and National Development: The Nigerian Experience (pp. 23-38). Ibadan, Nigeria: Stirling-Horden Publishers

Tamuno, S. O. (2006), Globalization: A New Concept for an old World order, Harey Publications Coy, Port Harcourt.

Rupali S. (2018). "Impact of Globalization on Banking Services in India." SME Toolkit.

Levine, R. (2021). International Financial Liberalization and Economic Growth. Journal of Economic Literature, 35(2), 688-726

Schmukler, S. (2017). "Financial Globalization: Gain and Pain for Developing Countries." Federal Reserve Bank of Atlanta Economic Review (Second Quarter): 39–66.

Samuel G and Chris O (2022): "Globalization and the Nigeria financial sector" Department of Economics, Niger Delta University, Wilberforce Island, P.O. Box 1464, Yenagoa, Bayelsa State, Nigeria. ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)Vol.3, No.13, 2022

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ENTREPRENEURSHIP, INCLUSIVE GROWTH AND POVERTY REDUCTION IN NIGERIA (1975-2022)

[*]Samuel Olumuyiwa Olusanya, [2*]Jelili Babatunde Sufian & [2*]Eucharia Chibuzo Ume
[1]Department Economics, National Open University of Nigeria
[2]Department of Business Administration, National Open University of Nigeria
[*]Corresponding authors' email: oolusanya@noun.edu.ng; bsufian@noun.edu.ng; euume@noun.edu.ng

ABSTRACT
The paper examines the relationship between entrepreneurship, inclusive growth, and poverty reduction in Nigeria from 1975 to 2022. The primary objective is to analyze how various factors namely entrepreneurship, inclusive growth, education level, access to finance, infrastructure development, and government policies impact poverty reduction in the country. Utilizing multiple regression analysis as the estimation technique, the findings reveal that both entrepreneurship and inclusive growth have significant positive effects on poverty alleviation. In contrast, the relationships of education, access to finance, infrastructure, and government policies with poverty reduction are more complex and negative. This underscores the necessity for targeted reforms and improvements. In conclusion, the paper highlights that entrepreneurship and inclusive growth are crucial for reducing poverty in Nigeria, while the influences of education, access to finance, infrastructure, and government policies are multifaceted and often adverse. Therefore, the paper advocates for government initiatives to support entrepreneurship, foster inclusive growth, enhance educational quality, improve access to financial resources, invest in infrastructure, and strengthen policy implementation to effectively tackle poverty in Nigeria.

Keywords: *Entrepreneurship, Inclusive Growth, Poverty Reduction and infrastructure*

1.0 INTRODUCTION

Entrepreneurship plays a critical role in Nigeria's efforts to promote inclusive growth and reduce poverty. Small and medium-sized enterprises (SMEs) are central to this objective, contributing significantly to GDP growth, job creation, and economic diversification. SMEs provide vital employment and income opportunities, especially for marginalized groups such as women and youth, who often face limited access to formal employment. The informal sector, which employs a large portion of the population, is particularly important in helping individuals escape poverty (Ogundele et al., 2023).

Despite its potential, entrepreneurship in Nigeria faces significant challenges. Limited access to affordable financing, bureaucratic hurdles, inadequate infrastructure, and a lack of entrepreneurial skills impede the success of many startups (Adeleke, 2021). To unlock the full potential of entrepreneurship, it is essential to implement policy interventions. These should include improving access to credit, streamlining business regulations, and investing in critical infrastructure, which would create a more favorable environment for business growth. Government support is crucial in fostering entrepreneurship. Financial institutions should offer affordable credit, and government policies must focus on eliminating bureaucratic bottlenecks. Targeted support for marginalized groups, particularly women and youth, is also key to promoting broader economic inclusion. Initiatives that provide tailored financial support and mentorship for women and youth entrepreneurs are essential for encouraging greater participation in the entrepreneurial sector (Ogundele et al., 2023). The rise of tech hubs and innovations in sectors like agribusiness further demonstrate the potential of entrepreneurship to drive productivity, innovation, and job creation (Olawale & Garuba, 2022). However, persistent challenges such as high poverty levels, financial exclusion, inadequate education, and poor infrastructure continue to limit the impact of entrepreneurship on inclusive growth. Furthermore, economic growth often benefits certain sectors or regions, leaving large parts of the population in poverty (Ogunleye & Dada, 2021).

To address these issues, reforms are needed in the education system to better align it with labor market needs, enhance access to financial services for low-income individuals, and improve infrastructure to support economic activities. Government policies aimed at reducing poverty must be better implemented, monitored, and targeted to reach the most vulnerable populations (Oluwaseun et al., 2022). By integrating entrepreneurship into broader strategies for inclusive growth, Nigeria can create sustainable economic opportunities for its citizens (Adebisi & Olayinka, 2020). This paper examines the impact of entrepreneurship on poverty reduction in Nigeria, focusing on the influence of inclusive growth, the effect of education levels, the role of access to finance, and the impact of infrastructure development on poverty reduction. It also assesses the

influence of government policies on poverty reduction in the country.

2.0 REVIEW OF RELATED WORK

Entrepreneurship plays a crucial role in driving economic growth, particularly in developing countries like Nigeria, by fostering innovation, creating jobs, and addressing societal needs. Shane (2018) defines entrepreneurship as the process of identifying and seizing opportunities through the development of new products, services, or markets, with an emphasis on innovation, risk-taking, and proactive actions to achieve profitability. Kuratko (2020) similarly describes entrepreneurship as a dynamic, visionary process driven by creativity, energy, and passion, where new ideas are implemented to solve business challenges. Hisrich and Peters (2019) explain entrepreneurship as managing a business to achieve profitability while accepting the risks associated with innovation, particularly in identifying and acting on market opportunities. Bygrave and Zacharakis (2021) extend this view by defining entrepreneurship as the pursuit of opportunities outside of current resources, focusing on innovation, risk management, and proactive actions to foster new ventures. Baumol (2020) further emphasizes the role of entrepreneurship as a catalyst for economic development, wherein entrepreneurs combine resources creatively to exploit market opportunities and drive sustainable growth.

Inclusive growth, as defined by Rauniyar and Kanbur (2020), involves economic development that promotes equal opportunities across social groups, focusing on reducing poverty and improving living standards through broad participation in economic activities. Anand, Mishra, and Peiris (2021) add that inclusive growth is a sustainable process where the benefits of economic expansion are shared across all income and social groups, which helps reduce inequality. Klasen (2019) emphasizes that inclusive growth should not only provide meaningful employment but also improve access to essential services for marginalized populations, promoting both social equity and economic development. Similarly, Ali and Zhuang (2020) argue that inclusive growth should ensure that economic opportunities benefit the poorest segments of society, considering both the pace and pattern of growth. McKinley (2022) highlights inclusive growth as an economic model that integrates social policies aimed at poverty reduction and inequality, ensuring that disadvantaged groups benefit from growth and contribute to social stability. Todaro and Smith (2020) define poverty reduction as the process of improving the economic well-being of society's poorest, through policies that increase income, enhance access to education and healthcare, and create employment, ultimately raising living standards. Ravallion (2021) elaborates that poverty reduction is achieved through sustained decreases in the poverty rate, driven by economic growth, equitable income distribution, and targeted social protection measures.

Chambers and Conway (2019) view poverty reduction as a multifaceted approach, emphasizing the enhancement of human capabilities, improved access to essential services like healthcare and education, and the creation of economic opportunities for marginalized groups. Sachs (2021) notes that poverty reduction strategies must address both absolute and relative poverty, ensuring equitable access to resources, promoting sustainable economic growth, and reducing inequalities through effective governance and social interventions. Sen (2020) emphasizes that poverty reduction should focus on expanding individual freedoms and capabilities, allowing people to live better lives by addressing vulnerabilities and improving well-being.

The theoretical foundation of this paper draws on several key theories. The Entrepreneurship as Opportunity Recognition Theory, proposed by Shane and Venkataraman (2000), asserts that entrepreneurship is about recognizing and exploiting market opportunities. Entrepreneurs identify gaps and develop solutions, driving economic growth and poverty reduction. This theory highlights individual agency and market awareness but has been criticized for focusing too much on individual traits and not enough on structural barriers, such as insufficient infrastructure and financial systems, which may hinder opportunity recognition in developing countries like Nigeria.

In contrast, the Capability Approach, articulated by Sen (1999), focuses on enhancing individuals' capabilities and freedoms as a measure of development. This theory suggests that economic growth should be measured not only by income but by the opportunities available to individuals to improve their quality of life. The Capability Approach aligns with inclusive growth in Nigeria, advocating for policies that improve access to education, healthcare, and economic opportunities for marginalized groups. However, critics argue that the Capability Approach lacks clear guidelines for implementation, which can lead to vague applications that may not address specific local challenges effectively.

The Inclusive Growth Framework, developed by McKinley (2010), emphasizes that economic growth must be both equitable and inclusive, addressing income disparities while ensuring that the benefits of growth reach marginalized groups. This framework underscores the role of government policies and social safety nets in promoting fair resource distribution. However, critics contend that it may be overly optimistic about the

effectiveness of government interventions, particularly in complex socio-economic environments like Nigeria, where challenges such as corruption and mismanagement can hinder inclusive growth efforts.

The Capability Approach, therefore, is crucial for understanding the interplay between entrepreneurship, inclusive growth, and poverty reduction. By focusing on individual capabilities and freedoms, this theory supports an entrepreneurial mindset, equipping marginalized individuals with the skills and resources necessary to recognize and capitalize on market opportunities. It also advocates for policies that ensure equitable access to resources for all societal segments, integrating disadvantaged groups into the economy. This approach reframes poverty not as a mere lack of income but as a deprivation of capabilities, which provides a framework for policies aimed at improving living standards and addressing systemic inequalities. This is particularly relevant in Nigeria, where overcoming such inequalities is vital for sustainable development.

In the empirical review, Obeng and Quartey (2021) used Pearson moment correlation to investigate the impact of entrepreneurship on poverty reduction in Nigeria, finding a significant relationship, though they acknowledged the omission of other key variables. Olawepo and Adeola (2022) applied structural equation modeling (SEM) to examine the link between inclusive growth and poverty reduction, demonstrating that inclusive growth strategies contribute significantly to poverty alleviation, though they noted limitations in data collection. Ilo and Inagbor (2021) used panel data regression to assess the impact of education on poverty reduction, finding a positive correlation but emphasizing the need for improved educational quality. Nduka (2022) used multiple regression analysis to analyze the effect of access to finance on poverty alleviation, revealing that financial access significantly impacts poverty reduction, despite challenges in the financial system's accessibility.

Akinlo and Akinwumi (2023) used path analysis to assess the effect of infrastructure development on poverty reduction, finding a significant influence through job creation but highlighting regional disparities. Alabi and Samuel (2022) applied autoregressive distributed lag (ARDL) modeling to investigate the role of government policies, finding a long-term relationship with poverty reduction, though they emphasized the need for stronger policy implementation. Afolabi and Afolabi (2021) used logistic regression to explore the link between entrepreneurship and poverty reduction, concluding that entrepreneurship positively influences poverty alleviation and requires supportive government frameworks. Similarly, Osunade and Ojo (2021) applied regression analysis to investigate the impact of inclusive growth on poverty reduction, finding a significant relationship but criticizing the lack of comprehensive data on marginalized populations.

3.0 METHODOLOGY

3.1 DATA COLLECTION PROCEDURE

The data for this study were obtained from the Central Bank of Nigeria's (CBN) Statistical Bulletin 2023, primarily relying on secondary data presented in the CBN publication. As a result, the paper adopts an ex post facto research design, focusing on the historical period from 1975 to 2022 to analyze trends and relationships relevant to the research objectives.

3.2 MODEL SPECIFICATION

The model specification for this study is outlined as follows:

The dependent variable (Poverty Reduction) is modeled as a function of the independent variables (Entrepreneurship and Inclusive Growth). Additionally, control variables such as education, access to finance, infrastructure, and government policies may be incorporated to enhance the robustness of the model.

$$PR = f(ENT, IG, EDU, FIN, INF, GP) \quad \ldots\ldots (1)$$

Functional Form:

$$PR = \beta_0 + \beta_1 ENT + \beta_2 IG + \beta_3 EDU + \beta_4 FIN + \beta_5 INF + \beta_6 GP + \epsilon t \quad \ldots\ldots (2)$$

Where:
PR: Poverty reduction
ENT: Entrepreneurship (measured by entrepreneurship rate, start-ups, or SMEs)
IG: Inclusive growth (could be measured by employment rate, income distribution, or access to basic services)
EDU: Education level (average years of schooling or literacy rate)
FIN: Access to finance (credit availability to small businesses or households)
INF: Infrastructure development (roads, electricity, internet access)
GP: Government policies (fiscal or development policies targeting entrepreneurship and poverty reduction)

The apriori expectation is based on the expected signs of the coefficient of the explanatory variables, such as β_1, $\beta_2 > 0$ while β_3, β_4, β_5, $\beta_6 < 0$ respectively. That is:

1. Increased entrepreneurship is expected to generate employment, increase income levels, and enhance economic activities, which can lead to poverty reduction.
2. Inclusive growth focuses on equitable distribution of economic benefits. Higher levels of inclusive growth are

expected to provide broader access to resources and opportunities, contributing to poverty alleviation.
3. Higher education levels generally correlate with better job opportunities and income, leading to reduced poverty levels.
4. Improved access to finance enables entrepreneurs and households to invest in businesses and education, ultimately reducing poverty levels.
5. Enhanced infrastructure (such as roads, electricity, and internet access) facilitates economic activities, improves productivity, and contributes to poverty reduction.
6. Effective government policies aimed at supporting entrepreneurship and inclusive growth are expected to lead to better economic outcomes and lower poverty levels.

4.0 RESULT AND ANALYSIS

4.1. RESULT OF MULTIPLE REGRESSION ANALYSIS

Dependent variable: PR
Method: least squares
Year of analysis: 1975-2022
Included observations: 47

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	0.499821	0.122096	4.093672	0.721
ENT	0.686515	0.711206	0.965282	0.002
IG	0.710098	0.887133	0.800441	0.003
EDU	-0.611043	0.221210	2.762275	0.551
FIN	-0.581539	0.112066	5.189254	0.445
INF	-4.683611	0.221003	21.192522	0.744
GP	-0.711254	0.112103	6.344647	0.227

R-squared	0.721985	Mean dependent var	18.67783
Adjusted R-squared	0.618971	S.D. dependent var	0.87761
S.E. of regression	0.443188	Akaike info criterion	6.76685
Sum squared resid	0.564110	Schwarz criterion	9.88421
Log likelihood	19.799824	F-statistic	41.44532
Durbin-Watson stat	2.141163	Prob (F-statistic)	0.0001

Source: Eview

4.2. Interpretation of multiple regression analysis result

The coefficient for entrepreneurship (ENT) is positive (0.686515) and statistically significant, which supports the expectation that entrepreneurship contributes to poverty reduction by creating jobs and fostering innovation. This is consistent with the findings of Obeng & Quartey (2021), who argue that entrepreneurship plays a pivotal role in alleviating poverty, particularly when coupled with effective microfinance strategies. The probability value of 0.002 underscores the significance of this relationship, reinforcing that entrepreneurship can be an effective tool for economic empowerment and poverty alleviation. Inclusive growth (IG) also exhibits a positive and statistically significant relationship with poverty reduction, as anticipated. The coefficient of 0.710098 and a probability value of 0.003 confirm that inclusive growth strategies contribute to poverty reduction, in line with the study's objectives. This finding aligns with recent empirical evidence from Olawepo & Adeola (2022), who emphasize the importance of inclusive economic policies to ensure equitable distribution of resources and opportunities for marginalized groups, effectively addressing poverty. In contrast, the education variable (EDU) presents a negative coefficient (-0.611043), which contradicts the expectation that higher education levels lead to poverty reduction. Education is typically seen as a pathway to increased human capital and economic opportunities; however, this result may reflect structural challenges within Nigeria's education system, such as poor quality or misalignment between the skills taught and labor market demands. Although the probability value (0.551) indicates that the relationship is not statistically significant, this finding resonates with Ilo & Inagbor's (2021) observation that improvements in education alone may not result in immediate poverty reduction without addressing issues of quality and relevance.

Access to finance (FIN) also shows a negative coefficient (-0.581539), which diverges from the expectation that greater access to financial services should alleviate poverty by supporting investments and entrepreneurship. While access to finance is generally associated with poverty reduction, Nduka (2022) notes that challenges such as high collateral requirements and low financial literacy can limit its effectiveness. The non-significant probability value (0.445) suggests that financial reforms may be necessary to enhance the impact of access to finance on poverty reduction. Infrastructure development (INF) presents a strongly negative coefficient (-4.683611), contradicting the expectation that improved infrastructure should support poverty reduction by enhancing productivity, mobility, and access to essential services. This surprising result, which is not statistically significant ($p = 0.744$), may reflect Nigeria's uneven infrastructure development, as highlighted by Akinlo & Akinwumi (2023), who point to regional disparities that hinder the broader benefits of infrastructure for poverty alleviation. Government policies (GP) also show a negative coefficient (-0.711254), which is contrary to the expectation that effective government policies would reduce poverty by fostering a favorable environment for economic growth. Alabi & Samuel (2022) found that while government policies have a long-term impact on poverty, poor implementation and corruption can undermine their positive effects, which could explain this result. The probability value (0.227) indicates the need for stronger policy enforcement and improved governance.

The R-squared value of 0.721985 suggests that 72.2% of the variation in poverty reduction can be explained by the variables included in the model, indicating a strong model fit. This aligns with the study's goal of examining the factors influencing poverty reduction in Nigeria. The F-statistic (41.44532) with a probability value of 0.0001 confirms that the overall model is statistically significant, suggesting that at least one of the independent variables meaningfully influences poverty reduction. This finding supports the broader objective of understanding how entrepreneurship, inclusive growth, education, access to finance, infrastructure, and government policies affect poverty levels in Nigeria.

4.3. Test of hypotheses

$H0_1$: Entrepreneurship has no significant impact on poverty reduction in Nigeria.

For the first hypothesis, the multiple regression analysis indicates a positive relationship between entrepreneurship and poverty reduction in Nigeria, with entrepreneurship being statistically significant. Therefore, the null hypothesis is rejected, and it is concluded that entrepreneurship significantly impacts poverty reduction in Nigeria.

$H0_2$: Inclusive growth has no significant impact on poverty reduction in Nigeria.

For the second hypothesis, the multiple regression analysis shows a positive relationship between inclusive growth and poverty reduction in Nigeria, with inclusive growth being statistically significant. Consequently, the null hypothesis is rejected, leading to the conclusion that inclusive growth has a significant impact on poverty reduction in Nigeria.

$H0_3$: Education level has no significant impact on poverty reduction in Nigeria.

For the third hypothesis, the multiple regression analysis reveals a negative relationship between education level and poverty reduction in Nigeria, with the education level being statistically insignificant. Therefore, the null hypothesis is accepted, concluding that education level has no significant impact on poverty reduction in Nigeria.

$H0_4$: Access to finance has no significant impact on poverty reduction in Nigeria.

For the fourth hypothesis, the multiple regression analysis reveals a negative relationship between access to finance and poverty reduction in Nigeria, with access to finance being statistically insignificant. Therefore, the null hypothesis is accepted, concluding that access to finance has no significant impact on poverty reduction in Nigeria.

$H0_5$: Infrastructure development has no significant impact on poverty reduction in Nigeria.

For the fifth hypothesis, the multiple regression analysis indicates a positive relationship between infrastructure development and poverty reduction in Nigeria; however, the parameter for infrastructure development is statistically insignificant. Consequently, the null hypothesis is accepted, leading to the conclusion that infrastructure development has no significant impact on poverty reduction in Nigeria.

$H0_6$: Government policies have no significant impact on poverty reduction in Nigeria.

The sixth hypothesis reveals that the multiple regression analysis indicates a negative relationship between government policies and poverty reduction in Nigeria, with the parameter for government policies being statistically insignificant. Consequently, we accept the null hypothesis and conclude that government policies have no significant impact on poverty reduction in Nigeria.

4.4. Discussion of findings

The findings of this paper offer a comprehensive understanding of the various factors influencing poverty reduction in Nigeria. A key observation is the significant role of entrepreneurship, which has a positive coefficient of 0.686515. This supports existing research, particularly the work of Obeng & Quartey (2021), who emphasize entrepreneurship as a crucial mechanism for economic empowerment through job creation and innovation. The low probability value of 0.002 further underscores that fostering entrepreneurship is a viable strategy for boosting economic growth and alleviating poverty in Nigeria.

The study also highlights the importance of inclusive growth, with a positive coefficient of 0.710098. This aligns with the views of Olawepo & Adeola (2022), who emphasize that equitable access to resources and opportunities is vital for effectively addressing poverty. The statistical significance of this relationship, supported by a probability value of 0.003, emphasizes the need for economic policies that promote inclusivity in order to achieve positive poverty reduction outcomes. In contrast, the study presents unexpected results regarding education level, which shows a negative coefficient of -0.611043. While education is generally viewed as a key factor in poverty reduction, this finding raises concerns about the quality and relevance of education in Nigeria. The lack of statistical significance ($p = 0.551$) suggests that improving educational access alone is insufficient unless it is aligned with labor market needs. This finding supports the view of Ilo & Inagbor (2021), who advocate for educational reforms that address real-world economic demands. Similarly, the negative coefficient for access to finance (-0.581539) contradicts the expected positive effect of financial inclusion on poverty alleviation. Nduka (2022) argues that barriers such as high collateral requirements and low financial literacy undermine the effectiveness of financial services. The non-significant probability value (0.445) highlights the need for reforms in the financial sector to improve accessibility and use of financial resources for poverty reduction.

Infrastructure development presents a notably negative coefficient of -4.683611, which contradicts the expectation that improved infrastructure would reduce poverty by enhancing productivity and access to essential services. The non-significant probability value (0.744) may reflect the uneven distribution of infrastructure development in Nigeria, as pointed out by Akinlo & Akinwumi (2023). Regional disparities in infrastructure can limit the effectiveness of such initiatives on poverty alleviation. The study also raises concerns about government policies, which show a negative coefficient of -0.711254. Despite expectations that effective government interventions would stimulate economic growth, Alabi & Samuel (2022) argue that poor implementation and systemic corruption undermine positive outcomes. The non-significant probability value (0.227) suggests that improving governance and policy enforcement is essential for realizing the intended benefits of government initiatives aimed at poverty reduction. The R-squared value of 0.721985 indicates that the model explains 72.2% of the variation in poverty reduction, suggesting a strong explanatory power. The F-statistic (41.44532) and its corresponding probability value (0.0001) further confirm the model's statistical significance, indicating that at least one of the independent variables meaningfully influences poverty reduction.

Therefore, this paper highlights that while entrepreneurship and inclusive growth have significant positive effects on poverty reduction in Nigeria, other factors such as education, access to finance, infrastructure, and government policies reveal more complex relationships that often undermine poverty alleviation efforts. These findings suggest the need for targeted reforms and further research to develop more effective strategies for poverty reduction in Nigeria.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, this paper has examined the impacts of entrepreneurship, inclusive growth, education, access to finance, infrastructure development, and government policies on poverty reduction in Nigeria. The findings suggest that entrepreneurship and inclusive growth play crucial roles in alleviating poverty, consistent with prior research by Obeng and Quartey (2021) and Olawepo and Adeola (2022). The positive relationship between entrepreneurship and poverty reduction highlights its contribution to job creation and economic resilience. Likewise, the significance of inclusive growth strategies emphasizes the importance of policies that ensure equitable resource distribution and opportunities for marginalized groups.

However, the analysis reveals more complex relationships for education, access to finance, infrastructure, and government policies. The negative impact of education levels points to systemic challenges within Nigeria's education sector, echoing concerns raised by Ilo and Inagbor (2021) regarding the quality and relevance of education. The findings on access to finance reflect Nduka's (2022) observations about the barriers to financial accessibility, which hinder poverty reduction efforts. Additionally, the results on

infrastructure development align with Akinlo and Akinwumi (2023), underscoring the vital role of infrastructure while acknowledging regional disparities.

This study contributes to the literature by integrating these variables into a comprehensive framework, offering a broader understanding of their interconnections and their collective impact on poverty reduction. While earlier studies often focused on individual factors such as entrepreneurship or education, this research takes a multifaceted approach, providing a more thorough analysis of the factors influencing poverty in Nigeria. It also addresses limitations in prior studies, including gaps in data and the exclusion of critical variables.

The implications of this study emphasize the need for targeted reforms in education, financial systems, infrastructure, and government policies to enhance their effectiveness in poverty alleviation. Policymakers should consider the complex dynamics identified in this research when developing strategies that promote entrepreneurship and inclusive growth while addressing challenges related to education quality, financial access, infrastructure gaps, and government inefficiencies. By doing so, the findings make a valuable contribution to the ongoing discourse on poverty reduction in Nigeria, offering a solid foundation for future research and policymaking.

5.2. RECOMMENDATIONS

The findings of this paper lead to the following recommendations:

1. **Enhance Support for Entrepreneurship**: The government should introduce targeted initiatives that foster entrepreneurship through training programs, improved access to capital, and mentorship opportunities. This could include establishing incubation centers and providing incentives for startups, particularly in underserved areas, to encourage job creation and innovation.
2. **Promote Inclusive Growth Policies**: To ensure that economic growth benefits all sectors of society, the government should focus on implementing inclusive growth strategies. These policies should specifically address marginalized groups, ensuring equitable access to resources, opportunities, and social services, thereby addressing poverty more effectively.
3. **Improve Education Quality**: The government must prioritize enhancing the quality of education at all levels to ensure its contribution to poverty reduction. This can be achieved by investing in teacher training, updating curricula to better align with labor market demands, and ensuring educational facilities are adequately equipped.
4. **Facilitate Access to Finance**: To address the barriers to financial inclusion, the government should focus on improving access to financial services. This could involve reforming the financial sector to reduce collateral requirements, promoting financial literacy programs, and supporting microfinance institutions in reaching rural and underserved communities.
5. **Invest in Infrastructure Development**: The government should prioritize infrastructure projects that have a direct impact on poverty reduction, such as roads, electricity, and water supply. Ensuring equitable infrastructure development across regions will enhance productivity and improve access to essential services, thus promoting economic activities that help lift communities out of poverty.
6. **Strengthen Policy Implementation and Governance**: Effective government policies are critical for poverty reduction. The government should focus on improving the execution of existing policies, enhancing transparency, and combating corruption. Establishing a robust monitoring and evaluation framework will enable the assessment of policy impacts on poverty reduction and ensure accountability.

REFERENCES

Adebisi, S. O., & Olayinka, A. A. (2020). Access to Finance and Poverty Reduction in Nigeria. African Journal of Finance and Economics, 12(4), 66-79.

Adeleke, A. (2021). The Role of SMEs in Nigeria's Economic Diversification and Poverty Reduction. Journal of Entrepreneurship and Economic Development, 15(2), 123-140.

Adeleye, I., & Olatunji, A. (2020). Education, gender, and poverty reduction in Nigeria: A hierarchical regression analysis. Journal of Gender Studies, 29(4), 489-504.

Afolabi, J., & Afolabi, A. (2021). Entrepreneurship and poverty reduction in Nigeria: A logistic regression analysis. International Journal of Entrepreneurship, 25(3), 205-218.

Agu, P. I., Uche, N. N., & Onyekwere, I. I. (2022). The Role of Entrepreneurship in Poverty Reduction: A Study of SMEs in Nigeria. Journal of Entrepreneurship and Development Studies, 14(3), 45-62.

Ajayi, K., & Igbinosa, E. (2023). Infrastructure development and poverty reduction in Nigeria's agricultural sector: A regression analysis. Agricultural Economics Research Review, 36(1), 83-95.

Akinlabi, Y. K., & Yusuf, T. T. (2022). Infrastructure Development and Poverty Alleviation in Nigeria. Nigerian Infrastructure Development Review, 11(1), 90-106.

Akinlo, A. E., & Akinwumi, A. (2023). Infrastructure development and economic growth in Nigeria: An empirical analysis. African Journal of Economic and Sustainable Development, 12(2), 134-148. doi:10.1504/AJESD.2023.126874

Alabi, D., & Samuel, A. (2022). Government policies and their impact on poverty reduction in Nigeria: An autoregressive distributed lag approach. African Journal of Political Science, 18(2), 33-49.

Alabi, O. J., & Samuel, A. O. (2022). The impact of government policies on poverty alleviation in Nigeria: An empirical analysis. Nigerian Journal of Public Administration, 18(1), 25-40. doi:10.5430/njpa.v18n1p25

Ali, I., & Zhuang, J. (2020). Inclusive growth for sustainable development in developing Asia: The enabling role of infrastructure development. Asian Development Review, 6(3), 88-104.

Anand, R., Mishra, S., & Peiris, S. J. (2021). Inclusive growth revisited: Measurement and determinants. International Monetary Fund, 19(8), 255-270.

Bassey, E., & Ibanga, U. (2023). Access to finance in poverty reduction among agricultural cooperatives: A regression analysis. Nigerian Journal of Agricultural Economics, 12(1), 32-48.

Baumol, W. J. (2020). The Microtheory of Innovative Entrepreneurship. Princeton University Press.

Bygrave, W. D., & Zacharakis, A. (2021). The Portable MBA in Entrepreneurship. 5th edition. John Wiley & Sons.

Chambers, R., & Conway, G. (2019). Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. Institute of Development Studies, 9(6), 65-80.

Eze, E., & Okafor, C. (2022). Access to finance and poverty reduction in rural households: Evidence from structural equation modeling in Nigeria. Journal of Rural Development, 41(2), 105-119.

Eze, N. O., & Okeke, F. N. (2023). Education and Poverty Reduction in Nigeria: An Empirical Analysis. Journal of African Development, 18(1), 112-128.

Hisrich, R. D., & Peters, M. P. (2019). Entrepreneurship. McGraw-Hill Education.

Ilo, S. E., & Inagbor, D. A. (2021). The impact of education on poverty reduction in Nigeria: Issues and challenges. Journal of Education and Practice, 12(15), 80-90. doi:10.7176/JEP/12-15-11

Ilo, S., & Inagbor, E. (2021). The influence of education level on poverty reduction in Nigeria: A panel data regression analysis. Journal of Education and Practice, 12(3), 15-28.

Klasen, S. (2019). Measuring and monitoring inclusive growth: Multiple definitions, open questions, and some constructive proposals. Asian Development Bank Economics Working Paper Series.

Kuratko, D. F. (2020). Entrepreneurship: Theory, Process, and Practice. 11th edition. Cengage Learning.

McKinley, T. (2010). Inclusive growth: A framework for evaluating public investment in infrastructure. United Nations Development Programme (UNDP).

McKinley, T. (2022). Inclusive growth: From conceptualization to action. United Nations Development Programme.

Nduka, J. (2022). Financial inclusion and poverty alleviation in Nigeria: Challenges and prospects. Nigerian Journal of Economic and Financial Issues, 12(1), 123-138. doi:10.5430/njefi.v12n1p123

Nduka, O. (2022). Access to finance and poverty alleviation among SMEs in Nigeria: A multiple regression analysis. Journal of Business and Management, 10(1), 67-82.

Nwankwo, U., & Eze, M. (2022). The impact of entrepreneurship development on poverty reduction among micro-entrepreneurs in Nigeria: A regression analysis. International Journal of Small Business and Entrepreneurship Research, 10(2), 44-60.

Obeng, C., & Quartey, P. (2021). The impact of entrepreneurship on poverty reduction in Nigeria: Evidence from Pearson moment correlation analysis. African Journal of Economic and Management Studies, 12(1), 23-37.

Obeng, C., & Quartey, P. (2021). The role of entrepreneurship in poverty alleviation: Evidence from Ghana. Journal of Entrepreneurship in Emerging Economies,

13(3), 459-473. doi:10.1108/JEEE-04-2020-0131

Obi, J., & Ugwu, A. (2021). Government policies and poverty reduction: A qualitative data analysis approach in Nigeria. Journal of Policy Analysis and Management, 40(3), 775-790.

Ogundele, O., Johnson, L., & Smith, R. (2023). Entrepreneurship and Inclusive Growth in Nigeria's Informal Sector. International Journal of Entrepreneurship, 10(1), 77-95.

Ogunleye, T. A., & Dada, O. K. (2021). Inclusive Growth and Poverty Reduction: Lessons from Nigeria. Economic Policy Review, 29(2), 88-104.

Olawale, M., & Garuba, S. (2022). Entrepreneurial Initiatives in Agribusiness: Transforming Rural Nigeria. Journal of Agribusiness and Rural Development, 8(3), 150-165.

Olawepo, J., & Adeola, O. (2022). Inclusive growth and poverty reduction in Nigeria: A critical analysis. International Journal of Development Issues, 21(1), 41-55. doi:10.1108/IJDI-05-2021-0125

Oluwaseun, I. O., Adewale, A. O., & Olamide, E. P. (2022). Government Policies and Poverty Reduction in Nigeria: Challenges and Prospects. Nigerian Economic Journal, 25(2), 134-149.

Osunade, O., & Ojo, A. (2021). Assessing the impact of inclusive growth on poverty alleviation in Nigeria: A regression analysis. Nigerian Journal of Economic Studies, 13(2), 60-75.

Rauniyar, G., & Kanbur, R. (2020). Inclusive development: Two papers on conceptualization, application, and the ADB's work on inclusiveness. Asian Development Bank.

Ravallion, M. (2021). The Economics of Poverty: History, Measurement, and Policy. Oxford University Press.

Sachs, J. D. (2021). The End of Poverty: Economic Possibilities for Our Time. Penguin Press.

Sen, A. (1999). Development as freedom. Oxford University Press.

Sen, A. (2020). Poverty and Famines: An Essay on Entitlement and Deprivation. Clarendon Press.

Shane, S. (2018). Entrepreneurship: A Process of Opportunity Exploration and Exploitation. McGraw-Hill.

Shane, S., & Venkataraman, S. (2000). Entrepreneurship as opportunity recognition. In Z. J. Acs & D. B. Audretsch (Eds.), Handbook of entrepreneurship research. Kluwer Academic Publishers.

Todaro, M. P., & Smith, S. C. (2020). Economic Development. 13th edition. Pearson.

Umar, A., & Ibrahim, B. (2021). Education's effect on poverty reduction in Nigeria: A focus on public spending. African Education Journal, 8(4), 275-290.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

WOMEN'S CONTRIBUTION TO CONFLICT RESOLUTION AND ITS IMPACT ON PEACE-BUILDING AND SUSTAINABLE DEVELOPMENT IN RWANDA: A THEORETICAL ANALYSIS

[1]Anthonia Hafunjoh Okonye & [2]Samuel Olumuyiwa Olusanya
[1]Department of Peace studies and conflict resolution, National Open University of Nigeria
[2]Department Economics, National Open University of Nigeria
Corresponding Emails: aokonye@noun.edu.ng; oolusanya@noun.edu.ng

ABSTRACT
The role of women in peacebuilding and conflict resolution is crucial in Rwanda, particularly following the 1994 genocide that resulted in the deaths of approximately 800,000 people. In the aftermath, the country prioritized healing, reconciliation, and reconstruction, and women emerged as key contributors, drawing from their unique experiences and perspectives. The genocide disrupted traditional gender norms, leading many women to take on leadership roles as heads of households and community leaders. Despite facing significant trauma, including sexual violence and loss, Rwandan women exhibited remarkable resilience, actively engaging in community rebuilding efforts. Organizations like the Association of Rwandan Women in the Diaspora (AFRD) and the Rwandan Women's Network (RWN) provided vital platforms for women to share their experiences, advocate for justice, and promote peace. Rwanda has made significant advancements in empowering women, especially in politics, with over 60% of parliamentary seats held by women—the highest percentage globally. This representation has enabled women to influence policies concerning gender equality and peace. Additionally, grassroots initiatives led by women have fostered social cohesion and addressed the root causes of conflict through community-based groups and peace clubs. However, challenges persist, such as entrenched gender stereotypes and limited access to resources. Overall, the contributions of women in Rwandan peacebuilding underscore their transformative leadership roles in promoting enduring peace and creating a more inclusive society.

Keywords: *Gender equality, Grassroots conflict resolution, Peacebuilding*

1.0 INTRODUCTION

Stability and prosperity in post-conflict nations, especially in Rwanda after the 1994 genocide that claimed over 800,000 lives, depend heavily on peacebuilding and conflict resolution. Women have emerged as key players in these processes, overcoming historical marginalization to assume leadership roles that foster unity and reconciliation (Rwanda Governance Board, 2022). Despite enduring severe trauma, many Rwandan women are actively engaged in rebuilding their communities through grassroots organizations, promoting communication and understanding between genocide victims and their communities (Kagwanja & Kanyinga, 2023).

Research highlights the systemic exclusion of women from formal peace negotiations, despite their status as the primary victims of violence. Between 1990 and 2017, global statistics reveal that women accounted for only 2% of conflict mediators and 8% of peace negotiators, indicating their marginalization in conflict resolution (UN Women, 2018). However, when given the opportunity, women have proven to excel in peacebuilding roles (Bercovitch, 2021). Examples from other African nations, such as the Wajir Peace and Development Committee in Kenya and the Harambe Women's Forum in South Africa, demonstrate the effectiveness of women in post-conflict reconciliation efforts (Bophela, 2021). In Rwanda, women represent 45% of community mediators and play vital roles in reintegrating former combatants and supporting genocide survivors (Republic of Rwanda, 2022). Despite the deep-rooted mistrust that followed the genocide, Rwanda has made significant progress in recovery and reconciliation, with a focus on addressing the underlying grievances to prevent future violence (Akanbi, 2023). Women's contributions to peacebuilding are crucial, showcasing their transformative potential in creating a fairer, more resilient society as Rwanda continues its journey toward healing.

1.2. HISTORICAL CONTEXT: WOMEN IN RWANDAN SOCIETY

Historically, Rwandan culture was shaped by patriarchal norms that favored men in both family and public life. However, women played essential roles in agriculture, home management, and cultural preservation, with some women holding authority as chiefs and queen mothers. The colonial period introduced Western gender norms, further marginalizing women and solidifying patriarchal

structures in the administrative realm (Akanbi, 2023). Although Rwanda gained independence in 1962, gender inequality persisted, limiting women's access to political, economic, and educational opportunities.

The Rwandan Genocide significantly altered the country's gender dynamics. As the genocide took between 800,000 and 1 million lives, women comprised the majority of the survivors. This demographic shift propelled women into new economic and social roles, prompting a reevaluation of gender roles (Kagwanja & Kanyinga, 2023). In the aftermath, Rwanda made considerable progress in reconstruction and reconciliation, implementing initiatives aimed at women's empowerment and addressing gender inequality. The government introduced policies to increase women's political representation, resulting in one of the highest percentages of female parliamentarians worldwide (Rwanda Governance Board, 2022). Numerous programs were created to enhance women's healthcare, education, economic opportunities, and leadership development. However, challenges remain, including limited access to leadership positions, financial resources, and ongoing gender-based violence (UN Women, 2018). Achieving full gender equality in Rwanda is still a work in progress.

1.3. WOMEN'S ROLES DURING THE RWANDAN GENOCIDE

During the 1994 Rwandan Genocide, women assumed various roles shaped by the social norms and historical context of the time. As survivors, many women witnessed the atrocities firsthand, navigating the chaos to protect themselves and their families from violence, including sexual assault. Many took on caregiving responsibilities for elderly relatives and orphaned children, providing both emotional and physical support after the genocide (Dorsey & Fogg, 2021).

Some women resisted the genocide by sheltering Tutsis and opposing violence, often at great personal risk. These acts of defiance were often carried out discreetly due to the severe consequences of resistance. While less acknowledged, some women actively participated in the genocide, either through direct involvement in massacres, inciting violence, or aiding perpetrators in identifying Tutsis. They also contributed to organizing community efforts for both resistance and violence, including providing humanitarian relief and disseminating propaganda (Hogg, 2023).

In the post-genocide period, numerous women became activists, advocating for justice and highlighting the atrocities committed during the genocide. Despite societal constraints, many women took on leadership roles within their communities, engaging in grassroots initiatives aimed at fostering peace and reconciliation. Recognizing the varied experiences and contributions of women during this turbulent period is essential, as their roles significantly shaped both the narrative of the genocide and its aftermath (Kagwanja, 2023).

1.4. WOMEN'S PARTICIPATION IN CONFLICT RESOLUTION IN RWANDA

Women's participation in politics has been a significant aspect of conflict resolution in Rwanda, particularly with their representation in parliament, where they have held over half of the seats since 2003. This makes Rwanda one of the countries with the highest percentage of female lawmakers globally. This remarkable representation is largely due to government initiatives, including gender quotas, aimed at enhancing women's involvement in decision-making processes (Dorsey, 2022).

Moreover, Rwandan women have taken leading roles in grassroots reconciliation efforts, working to heal the wounds of the past and foster social cohesion. Women-led community organizations and peacebuilding initiatives have been instrumental in promoting dialogue, forgiveness, and healing within local communities. These programs often address poverty, trauma, and social marginalization, all of which contribute significantly to violence (Hogg, 2023).

Additionally, Rwandan women have been central in advocating for accountability and justice for the crimes committed during the genocide. Many have courageously spoken out against impunity and demanded justice for their families and communities. Their efforts have contributed to the establishment of Gacaca courts, which focus on community-based justice, as well as the prosecution of offenders through both domestic and international legal systems. Thus, women's involvement in conflict resolution in Rwanda not only demonstrates their resilience but also plays a pivotal role in advancing peace and progress. By amplifying and recognizing women's voices, Rwanda can continue its journey toward justice, peace, and gender equality (Kagwanja, 2023).

1.5. CHALLENGES FACED BY WOMEN IN PEACEBUILDING EFFORTS IN RWANDA

Despite their essential roles in conflict resolution and peacebuilding, Rwandan women face significant challenges in accessing and influencing peace processes. They are often underrepresented or entirely excluded from formal peace negotiations and decision-making bodies, which limits their ability to advocate for their interests and concerns (Munyaneza, 2022). Traditional gender roles and societal norms further complicate their participation, as cultural attitudes may downplay the relevance of women's perspectives in conflict resolution. Systemic barriers, such as discriminatory laws, limited resources, and political marginalization, hinder women's

participation in public and political spheres, including peace processes. These barriers restrict their access to essential resources like education, information, and networks, which are crucial for effective advocacy and negotiation (Ngabonziza, 2023). Additionally, security threats and risks associated with involvement in peacebuilding efforts, especially in conflict-affected areas, may deter women from actively participating in peace processes.

Although Rwandan women contribute significantly to grassroots peacebuilding, these efforts are often unrecognized or undervalued in official peace negotiations. This lack of acknowledgment perpetuates their marginalization and diminishes their motivation to engage in peacebuilding. Addressing these challenges is crucial to enhancing women's meaningful participation in peace processes and ensuring that their contributions are valued (Uwera, 2023).

1.6. SUCCESS STORIES: WOMEN-LED NON-GOVERNMENTAL ORGANIZATIONS AND PEACEBUILDING IN RWANDA

Since the 1994 genocide, Rwanda has made significant progress in rebuilding and reconciling, with women playing a critical role in both formal organizations and grassroots initiatives. A notable example is the Association of Genocide Widows Agahozo (AVEGA Agahozo), founded in 1995 by widows who survived the genocide. This women-led organization advocates for the rights of survivors and provides critical support, including advocacy, skills training, financial assistance, and counseling. By empowering these women, AVEGA Agahozo has contributed to Rwanda's healing and reconciliation process (Ishimwe, 2022).

Another key organization is Twese Hamwe, a network of Rwandan women's groups dedicated to advancing women's rights, gender equality, and peacebuilding. Led by women from various sectors, the Partnership for the Homeless (PFTH) implements community engagement and capacity-building programs to empower women and girls. Their initiatives focus on gender-based violence and economic empowerment, promoting a more inclusive society (Munyaneza, 2023).

Women for Women International (WfWI) is an NGO focused on assisting disadvantaged women in conflict-affected countries. In Rwanda, WfWI provides business education, psychosocial support, and skills training, empowering thousands of genocide survivors to become agents of change in their communities and contribute to peace and reconciliation (Uwera, 2023).

The Rwanda Women's Network (RWN) is another leading organization that promotes social justice, gender equity, and women's empowerment. With a focus on addressing the root causes of gender inequality, RWN works to increase women's participation in decision-making through advocacy, community mobilization, and capacity-building initiatives (Niyonzima, 2023).

These women-led NGOs demonstrate that women are essential to Rwanda's peace and reconciliation efforts. By addressing the needs of vulnerable populations and empowering women as change agents, these organizations contribute to building a more resilient, inclusive, and peaceful society in Rwanda.

1.7. LESSONS LEARNED FOR PEACEBUILDING IN RWANDA

The lessons learned from Rwanda's peacebuilding efforts continue to shape global approaches to conflict resolution and restitution. The 1994 Rwandan genocide vividly illustrated the detrimental effects of exclusion and marginalization in peace processes. Gendered exclusion, particularly the sidelining of women, highlights the necessity of ensuring that peace efforts are inclusive, encompassing all segments of society (Bercovitch, 2021).

One of the critical lessons is the importance of gender-sensitive peacebuilding. Rwanda's success in empowering women in post-genocide society showcases the power of women's involvement in healing and rebuilding processes. By recognizing and supporting women's roles in peacebuilding, Rwanda has set an example for other countries emerging from conflict to adopt gender-inclusive approaches to reconciliation and development (Kagwanja, 2023).

The value of grassroots involvement in peacebuilding has also been emphasized in Rwanda's efforts. Women's leadership in community-level peace initiatives has been critical to fostering social cohesion and rebuilding trust among different segments of society (Dorsey, 2022). Rwanda's experience demonstrates that empowering women and engaging them at all levels of peacebuilding is essential to creating a durable and sustainable peace.

In conclusion, Rwanda's post-genocide recovery has been significantly influenced by women's active participation in peacebuilding, despite ongoing challenges. Women have played an instrumental role in shaping the country's recovery and continue to be key players in the nation's reconciliation, justice, and development processes. Their resilience and leadership in peacebuilding efforts are vital lessons for conflict-affected countries globally.

2.0 CONCLUSION

Women play a vital, though often underrecognized, role in conflict resolution, particularly in Rwanda, which has a complex history of genocide and conflict. Despite their ongoing contributions to peacebuilding, women have often been excluded from formal peace processes.

However, following the 1994 genocide, Rwandan women displayed remarkable resilience and determination in rebuilding their communities, significantly contributing to social cohesion, reconciliation, and long-term peace (McKay & Mazurana, 2021). A key lesson from their involvement is the necessity of including women in decision-making processes. Their unique perspectives and lived experiences enhance discussions and ensure that the needs of all societal groups are adequately addressed. Rwanda has made notable progress in increasing women's representation in peace negotiations and post-conflict reconstruction, positioning itself as a model for other nations facing similar challenges (Uvin, 2020).

Additionally, women's participation in conflict resolution is crucial for addressing systemic issues such as trauma, injustice, and gender-based violence. Women-led initiatives that focus on economic empowerment, healthcare, education, and psychosocial support have played a critical role in healing and fostering reconciliation at the local level. Research shows that when women are involved in peacebuilding efforts, the likelihood of sustainable peace agreements increases, and the risk of conflict recurrence decreases, as underlying issues are addressed and community trust is fostered (McKay & Mazurana, 2021). The experiences of Rwandan women in conflict resolution offer valuable lessons for global peacebuilding initiatives. Their resilience, leadership, and contributions are essential for rebuilding communities and establishing a foundation for lasting peace. To ensure enduring stability, it is essential to recognize and elevate women's voices in conflict resolution processes (Uvin, 2020).

2.1 RECOMMENDATIONS

To strengthen women's roles in peacebuilding and conflict resolution in Rwanda, the following recommendations are proposed:

1. Full Participation: Ensure that women are actively involved in all stages of peacebuilding, from the formulation to the execution of agreements, through capacity-building programs and affirmative action policies such as quotas.
2. Remove Systemic Barriers: Identify and dismantle obstacles that hinder women's contributions to peace efforts, including institutional biases, discriminatory laws, and sociocultural norms.
3. Access to Education and Training: Provide women in conflict-affected areas with access to educational opportunities and leadership training in areas such as mediation, negotiation, and conflict resolution.
4. Support Grassroots Initiatives: Offer financial and technical assistance to women's groups and grassroots movements advocating for peace and reconciliation, as they are essential in amplifying women's voices and rights.
5. Implement Gender-Sensitive Policies: Develop policies that address the specific needs of women in conflict zones, ensuring they have access to justice, healthcare, education, and economic opportunities.
6. Engage Men and Boys: Promote male involvement in gender equality initiatives and the prevention of violence against women, challenging harmful gender norms and supporting women's leadership.
7. Document Best Practices: Collect and share successful strategies that promote women's participation in peacebuilding to inform future policies and programs.
8. Monitor Progress: Establish monitoring systems to assess the effectiveness of initiatives designed to enhance women's involvement, ensuring accountability and identifying areas for improvement.

REFERENCES

Akanbi, T. (2023). Reconciliation in Rwanda: A pathway to sustainable peace. *Journal of Peace Studies, 15*(2), 112-128.

Bercovitch, J. (2021). Women in peace processes: Evidence from case studies. *International Negotiation, 26*(1), 1-23.

Bophela, T. (2021). Women's leadership in post-conflict reconstruction: The case of Kenya and South Africa. *African Journal of Conflict Resolution, 21*(1), 45-62.

Dorsey, M. L. (2022). Gender representation in Rwandan politics: Progress and challenges. *Rwanda Journal of Social Sciences, 9*(2), 45-62.

Dorsey, M. L., & Fogg, K. (2021). Women in the Rwandan genocide: Survivors, resistors, and perpetrators. *Gender & History, 33*(1), 42-60.

Hogg, K. (2023). Grassroots peacebuilding in Rwanda: The role of women. *Journal of Peace Research, 60*(1), 87-103.

Ishimwe, E. (2022). Women-led organizations in Rwanda: Pathways to healing and reconciliation. *Journal of Peacebuilding and Development, 14*(3), 45-60.

Kagame, P. (2023). Lessons from Rwanda: Shaping global peacebuilding strategies. *African Journal of Peace Studies, 10*(1), 33-47.

Kagwanja, P. (2023). Women, war, and peacebuilding in Rwanda: An assessment of post-genocide roles.

African Journal of Political Science, 12(2), 119-134.

Kagwanja, P., & Kanyinga, K. (2023). The role of women in peacebuilding in Africa: Lessons from Rwanda. *African Peace and Security Studies, 8*(3), 167-183.

McKay, S., & Mazurana, D. (2021). Women and peacebuilding: The role of women in post-conflict reconstruction. *Journal of Peace Research, 58*(2), 291-304.

Mukamana, A. (2023). The role of international collaboration in peacebuilding initiatives: A Rwandan perspective. *Journal of International Relations, 14*(2), 45-58.

Munyaneza, J. (2023). Advancing gender equality and peacebuilding in Rwanda: The role of women-led initiatives. *Rwanda Journal of Gender Studies, 5*(2), 20-35.

Munyaneza, M. (2022). Barriers to women's participation in peace processes in Rwanda. *Rwanda Journal of Conflict Resolution, 5*(1), 15-30.

Ngabo, T. (2023). International justice and accountability: The role of gacaca courts in Rwanda. *Journal of Human Rights, 15*(2), 61-77.

Ngabonziza, J. (2023). Cultural attitudes and women's roles in peacebuilding: A Rwandan perspective. *Journal of Gender Studies, 12*(2), 120-135.

Niyonzima, A. (2023). The role of the Rwanda Women's Network in promoting social justice and women's empowerment. *Journal of Gender and Development, 11*(4), 88-102.

Rwanda Governance Board. (2022). Women's participation in governance and leadership in Rwanda. Kigali: Rwanda Governance Board.

UN Women. (2018). Women, peace and security: Global study on the implementation of United Nations Security Council Resolution 1325. New York: UN Women.

Umunyana, E. (2022). Addressing the roots of conflict: Insights from Rwanda's post-genocide recovery. *Journal of Conflict Resolution, 18*(4), 22-35.

Uvin, P. (2020). From war to peace: The role of women in Rwandan reconciliation. *Conflict, Security & Development, 20*(3), 265-284.

Uwera, C. (2023). Empowering women for peace: The impact of Women for Women International in Rwanda. *African Journal of Conflict Resolution, 9*(1), 78-92.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

IMPACT OF ISLAMIC BANKING ON ECONOMIC GROWTH IN NIGERIA

Imran Musa Adarehi and Faiza Haruna Maitala
Department of Business Administration, Nile University of Nigeria, Abuja
imranadarehi@gmail.com; faiza.maitala@nileuniversity.edu.ng

ABSTRACT
In Nigeria, there have been instances where the implementation of Islamic finance policies has been misconstrued as a perceived effort to promote Islamization within the country. The main objective of this study is to examine the effect of Islamic Finance on Economic Growth in Nigeria. An ex-post facto research design-based quantitative research methodology was used in this study. Both the dependent and independent variables are observed over the quarterly period; 2017Q1 to 2022Q4, comprising 24 quarters. Multiple Linear Regression Analysis estimated with Ordinary Least Squares (OLS) was used for analyzing the underlying statistical tests like regression tests and the test of correlation. The unit root test, co- integration model, error correction model, Granger causality test, and economic a priori expectation statistical method was used as estimation techniques. The study found that Sukuk bonds have insignificant positive effects on the gross domestic products with a p-value of 0.9804. Secondly, it was discovered that Islamic banks assets have insignificant positive effect on the gross domestic products with a p-value of 0.146. Thirdly, analytical evidence showed that these Islamic funds have insignificant positive effects on the gross domestic products with a p-value of 0.9632. The study concluded that Islamic finance products have a good prospect of driving the economy in Nigeria. Therefore, the study recommends that the Nigerian government should urgently provide the needed enabling environments for the growth and development of Islamic finance in Nigeria, in other to accumulate more capital from ethical-based sources to grow the economy.

KEYWORDS*: Gross Domestic Product, Islamic Finance Product, Islamic Bank Assets, Islamic Funds, Sukuk Bonds.*

1.0 INTRODUCTION

Globally, Islamic finance has evolved into a viable alternative to the western-styled financing model, as non-Muslim countries particularly in the West have adopted this Shariah-compliant model of financing. In fact, it is now the major competitor of the conventional financing model. However, of all the different Islamic finance products that have been innovated, Sukuk bonds remain the largest and widely used (Bakar & Baba, 2020). Sulaiman (2020) noted that the inception of the Sukuk market can be attributed to the year

The level of awareness regarding the economic advantages and infrastructural progress facilitated by sukuk in foreign nations is minimal or non-existent. In Nigeria, there have been instances where the implementation of certain policies has been misconstrued as a perceived effort to promote Islamization within the country (Duku & Muhammad, 2022; Bala et al., 2022).

The utilization of Islamic banking in Nigeria has the potential to facilitate the implementation of profit and loss sharing principles through the application of Islamic finance. Sukuk in particular can be a useful tool for raising funding and assisting with the nation's infrastructure development. To promote growth and development plans, especially in Nigeria, Sukuk financing is one option for funding capital projects. With the goals of bolstering the local securities market, encouraging financial inclusion, and assisting with infrastructure development, sukuk issuance got underway in September 2017 (Bakar & Baba, 2020).

The first Sukuk was issued in October 2013 by the government of Nigeria's Osun State through a Special Purpose Company (SPC). That's the equivalent of N11.4 billion in value ($70.6 million). A N60 billion Debt Issuance programme was issued at a rate of 14.75% per annum and matures on 8th October, 2020 (Oladunjoye, 2014) to fund the construction of two (2) primary schools, two (2) secondary schools, and twenty (20) higher education institutions. Iqbal (1997), Farqan and Mulyany (2009), Abuh and Chowdury (2012), and other researchers focused on Gulf and Asian nations have all argued that Islamic financial system development plays a significant role in an economy, leading to the assessment of efficiency and closely merged to economic growth.

The existing body of literature consistently indicates that the level of financial inclusion has not been rising sufficiently to facilitate access to the micro and macroeconomic advantages of inclusivity. Therefore, it is crucial to conduct a methodical investigation into the effects of Islamic financial inclusion on the advancement of the economy. Therefore, this study seeks to test the following hypotheses:

H01: Sukuk Bonds have no significant effect on the gross domestic product of Nigeria.
H02: Islamic banks assets have no significant effect on the gross domestic product of Nigeria.
H03: Islamic funds have no significant effects on the gross domestic product of Nigeria.

2.0 LITERATURE REVIEW

The study uses the finance-growth theory as its theoretical foundation, with the "supply-leading" influence of financial development being the primary focus. The increased economic activity is a direct result of this phenomenon's promotion of a dynamic and efficient environment. Strong financial institutions, according to the supply-leading theory, encourage the growth of financial services and make affordable capital available in advance of the demand from real economy actors. Increased rates of saving and investment, which boost the efficiency of capital accumulation, are commonly acknowledged as being driven by the existence and growth of financial markets.

The supply-leading hypothesis holds that the presence of efficient financial institutions is critical to increasing general economic efficiency, as suggested by the research of Alhassan et al. (2023). These institutions can create and increase liquidity, mobilize savings, ease the accumulation of capital, shift resources from slow-growing to fast-growing sectors, and encourage successful risk-taking and innovation in the latter. This phenomenon raises the bar for economic activity, which in turn boosts economic growth and development.

The supply-leading hypothesis is predicated largely on the findings of a study by Anthony-Orji et al. (2023). According to their research, the rise of the financial sector has a significant impact on economic growth since it allows for more efficient resource allocation. This indicates that the development of financial systems and the expansion of economic activity are unrelated. The supply-leading hypothesis, as opposed to the demand-following hypothesis, is seen as advantageous in the context of a typical growing economy like Nigeria's. Research by both Alhassan *et al.* (2023) and Anthony-Orji *et al.* (2023) demonstrates the critical function that financial intermediaries provide in sustaining economic expansion.

In the context of the endogenous growth model, financial markets have been shown to be exogenous in a number of empirical studies. The importance of financial intermediation in enabling long-term investments through the provision of loans has been highlighted by Bencivenga and Smith (1991). Deposits and capital stock rise as a result, helping the economy expand. All of this fit neatly within the framework of the endogenous growth concept. Similarly, Saint-Paul (1992) provided data to support the claim that financial markets significantly contribute to economic growth by encouraging entrepreneurship and easing the development of niche markets for specific technologies. Blackburn and Hung (1998) found that a combination of increased financial development and trade liberalization can spur the development of intermediation, which in turn boosts economic growth.

King (1993), Levine and Zervos (1998), Rajan and Zingales (1996, 2011), and Hassan et al. (2011) are just a few of the researchers who have found that improvements in financial and securities markets have a significant effect on boosting economic growth by encouraging new forms of enterprise. Therefore, under the framework of the endogenous growth model, this phenomenon is considered crucial for economic growth as it contributes to greater productivity. Fink et al. (2003), Thumrongvit et al. (2013), Kapingura and Makhetha-Kosi (2014), Pradhan et al. (2015), and Fanta and Makina (2017) are just a few of the prominent empirical studies that have shown the positive impact of securities financial markets on economic growth. According to the endogenous growth theory, the creation and expansion of the securities market is a major factor in boosting GDP.

Echchabi et al. (2016), Malikov (2017), Mitsaliyandito et al. (2017), Smaoui and Nechi (2017), Echchabi et al. (2018), and Sari et al. (2018) are only a few of the major studies focusing on Sukuk. Sukuk has been shown in numerous studies to significantly boost economic growth by opening the door to more investment and growing the capital stock. Sukuk issuing increases investments and the capital stock, which has a positive exogenous influence on economic growth, as predicted by the endogenous growth model. Furthermore, Islamic finance, as an external element within the framework of the endogenous development model, is having a positive effect on global economic growth, as stated by Ledhem and Mekidiche (2020). Given the importance of Sukuk in global Islamic finance and its beneficial effect on endogenous economic growth, it follows that Sukuk functions as an external factor that supports economic growth within the context of endogenous economic growth.

Islamic financing has been linked to increased economic growth in a number of scholarly studies (Kassim, 2016; Boukhatem and Moussa, 2018; Ledhem and Mekidiche, 2020). However, there is a lack of in-depth academic studies examining the connection between Sukuk and economic growth. Building on previous research on Sukuk and its effects on economic development, this study employs the endogenous growth model to explore the connection between Sukuk finance and economic

growth. In addition, using the endogenous growth model as a theoretical framework, this study intends to undertake an empirical investigation on the effect of Sukuk financing as an exogenous variable on economic expansion. This study is the first to apply the endogenous growth model to the question of whether or not Sukuk finance contributes to economic growth. Therefore, the general consensus is that this study will greatly enrich the existing body of knowledge.

Before and after the passage of Malaysia's Islamic Financial Services Act (IFSA) in 2013, Kamarudin et al. (2023) performed research into the relationship between the Islamic capital market and the country's GDP growth. The years 2007-2019 are included in the study. In this investigation, both quantitative and qualitative approaches were used. The ARDL method of cointegration is used in quantitative analysis, while in-depth interviews are conducted for the qualitative component. Based on the data, it appears that Shari'ah-compliant Securities (SCS) have a negative impact on GDP expansion. In contrast, Shari'ah-compliant market capitalization (SCMC) is positively correlated with actual economic growth over the medium to long term. This research shows that real economic growth in Malaysia is improved by the implementation of IFSA 2013. This is due to the expansion of the Islamic capital market sector. The coefficients and relevance of the industrial production index (IPI) have increased as a proxy for real economic development after IFSA 2013 was implemented. The qualitative results of the study further suggest that the Islamic capital market contributes to economic growth by keeping markets stable and making significant contributions to ESG factors. SRI Sukuk, the Bond Grant Scheme, Environmental, Social, and Governance Financing/Sukuk, and value-based judging projects are all examples of how this is accomplished.

The dynamic panel one-step system generalized method of moments was used as the best estimation method in a study by Ledhem (2022). The primary objective of this research was to examine the effect of Sukuk financing on economic expansion in Southeast Asian countries from the fourth quarter of 2013 to the third quarter of 2019. The total value of outstanding Sukuk was used to measure the extent of Sukuk financing, whereas GDP was used to measure the expansion of the economy. In-depth studies were conducted on Malaysian, Indonesian, and Bruneian Islamic financial institutions that participate in those countries' developed Sukuk financial markets. According to the results, Sukuk funding is crucial to the expansion of the Southeast Asian economy. Sukuk, a component of Islamic financial markets, is emphasized for its role in promoting economic growth in the region.

The fundamental goal of the recent empirical study by Naz and Gulzar (2022) was to evaluate the impact of issuance on the development of the economies of six Islamic countries: Bahrain, Indonesia, Malaysia, Pakistan, Saudi Arabia, and the United Arab Emirates. In order to determine whether or not one variable causes another, the authors used a dynamic panel cointegration model termed pooled mean group/autoregressive distributed lag (PMG/ARDL) and a panel causality test. Quarterly data for the years 2005 through 2000 has been compiled. Findings from this study lend credence to Schumpeter's supply-leading argument, which holds that issuance of Islamic finance products contribute to sustained economic growth in Islamic countries.

Yldrm et al (2020) research set out to measure how expanding the Sukuk market affects GDP expansion. The research focused on nine countries with Islamic banking and finance systems and spanned from the first quarter of 2014 to the fourth quarter of 2017. Economic expansion was evaluated using a panel cointegration regression approach, with GDP as the dependent variable. Total Sukuk exports were used as the dependent variable evaluation of the Sukuk market. Meanwhile, the Sukuk density metric was used to test the growth of the Sukuk market. In this analysis, the authors used market exchange, inflation, and monetary strain as independent variables. Researchers found evidence of a persistent cointegration link between the maturation of the Sukuk market and overall economic growth. The research found that both the prevalence of Sukuk and the export of Sukuk were positively associated with economic growth.

In addition, Kartini & Milawati (2020) research set out to demonstrate how much of an effect Islamic finance products and conventional bonds have had on Indonesia's economic growth from 2011 to 2019. Using the Autoregressive Distributed Lag (ARDL) technique, we analyzed the results over time scales both short and long. Based on the data presented here, it appears that Islamic finance products has no discernible effect on economic growth over the short term, while bonds have a clear bearing on economic growth. Sukuk has a significant impact on economic growth over the long term, while bonds have little to no effect on economic growth. This finding implies that unlike traditional bonds, Islamic finance products is seen as having greater potential by the general public in Indonesia.

Similar study by Al-Raeai et al. (2018) examined how macroeconomic factors affected the development of the Sukuk market in the Gulf Cooperation Council countries. The study looked at the years 2001-2016 specifically to make the case for Sukuk as a workable alternative funding mechanism. The expansion of the Sukuk market, the experts have concluded, can boost

economic expansion.

Three Islamic capital markets, specifically Sukuk, were studied by Sari et al. (2018) to determine their effect on Indonesia's economic development. The time-frame of the research was from January 2011 to December 2017. The study looked into whether or not there is a long-term connection between the Sukuk Islamic capital market and GDP expansion using cointegration regression analysis. According to the data, the Indonesian Sukuk market has the potential to play a major role in the country's long-term economic expansion.

In line with the existing academic literature, this study employed a suitable empirical model and carefully selected variables to examine the impact of Sukuk finance on economic growth in Nigeria. In addition to filling a gap in the existing body of knowledge, the current study uses the endogenous growth model as a theoretical framework to investigate the link between Sukuk funding and economic growth. This study is the first to use this theoretical framework to inquire into the connection between Sukuk finance and economic expansion. Therefore, it is widely agreed that this publication will add significantly to the body of existing knowledge.

3.0 METHODOLOGY

In order to quantitatively determine the relationship between Islamic Finance and Economic Growth in Nigeria, an ex-post facto research design-based quantitative research methodology was used in this study. The study's use of historical data from pertinent publications led to the adoption of this research methodology because those data were previously available. The time-series data for the period 2017Q1-2022Q4 (24 quarters) on Islamic finance products and economic growth is collected from various publications of the Central Bank of Nigeria (CBN) Statistical Bulletin, Annual Reports and Statement of Accounts, and the Debt Management Office (DMO) publications. In a bid to explain the relationship between Islamic Finance and economic growth, the researcher relied on secondary data in its quantitative nature. Multiple Linear Regression Analysis, which is estimated with Ordinary Least Squares (OLS), is an inferential statistics tool to be used for analyzing the underlying statistical tests like regression tests.

Table 1 Description of Variables and Measurements

Variables	Measurements	Source
Gross Domestic Products (GDP)	Refers to the total goods and services produced nationally in Nigeria annually.	Ogunbado (2019), Abubakar & Bala (2020), Ibrahim & Mustapha (2020), Bakar & Baba (2020), Bala et al. (2022), Alqatan et al. (2022), Duku & Muhammed (2022), El-Morabit et al. (2023).
Sukuk Bonds (SB)	Sharia-compliant debt security used for financing various projects.	Ogunbado (2019), Abubakar & Bala (2020), Ibrahim & Mustapha (2020), Bakar & Baba (2020), Bala et al. (2022), Alqatan et al. (2022), Duku & Muhammed (2022), El-Morabit et al. (2023).
Islamic Bank Total Assets (ISBTA)	Aggregated financial assets owned by interest-free banks that operate based on Shariah principles.	Ogunbado (2019), Abubakar & Bala (2020), Ibrahim & Mustapha (2020), Bakar & Baba (2020), Bala et al. (2022), Alqatan et al. (2022), Duku & Muhammed (2022), El-Morabit et al. (2023).
Islamic Bank Funds (ISBF)	Shariah-compliant investment funds that follow Islamic principles in their investment strategies.	Ogunbado (2019), Abubakar & Bala (2020), Ibrahim & Mustapha (2020), Bakar & Baba (2020), Bala et al. (2022), Alqatan et al. (2022), Duku & Muhammed (2022), El-Morabit et al. (2023).

In light of the analysis presented above, the proposed link is functionally defined as follows:

$IFB = f(ISB, ISBTA, ISF)$ 1

$GDP = f(IFB)$ 2

$IFP = \beta 0 + \beta 1(ISB) + \beta 2(ISBTA) + \beta 3(ISF) + \varepsilon 1$ 3

Where:

IFP = Islamic Finance Products (a composite index representing the broader category of Islamic finance products), GDPt = Gross Domestic Product at time t (dependent variable representing economic growth) ISB = Sukuk Bonds, ISB = Sukuk Bonds, ISBTA= Islamic Bank Total Assets, ISBF= Islamic Banks Fund.

DATA ANALYSIS

Table 2: Error Correction Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.022012	0.474960	8.468103	0.0000
ISB	-0.000506	0.162354	-0.003114	0.9975
ISBF	0.034385	0.313287	0.109757	0.9138
ISBTA	0.212727	0.162169	1.311759	0.2061
U(-1)	-0.043075	0.242338	-8.177748	0.0009
R-squared	0.293107	Mean dependent var		4.579475
Adjusted R-squared	0.136020	S.D. dependent var		0.133043
S.E. of regression	0.123665	Akaike info criterion		-1.152828
Sum squared resid	0.275273	Schwarz criterion		-0.905981
Log likelihood	18.25752	Hannan-Quinn criter.		-1.090747
F-statistic	1.865889	Durbin-Watson stat		1.969653
Prob(F-statistic)	0.160339			

Dependent Variable: GDP; Method: Least Squares; Date: 07/27/24 Time:02:47
Sample (adjusted): 2017Q2 2022Q4; Included Observations: 23 after adjustments.
Source: Author's Analysis

Table 2 provides insights into the error correction model's performance, revealing a relatively low coefficient of determination. Specifically, the R-squared value stands at approximately 0.2931 (29.31%), while the adjusted R-squared value is around 0.1360 (13.60%). The R-squared measures the proportion of variation in the dependent variable explained by changes in the explanatory variables. The F-statistic yields a value of 1.86, with an associated probability value of 0.16, exceeding the common 5% significance threshold. This suggests that, in the short run, the overall regression model lacks statistical significance at the 5% level. Consequently, the collective influence of the explanatory variables (ISB, ISBF, and ISBTA) explains a relatively low level of variation in the dependent variable (GDP), as indicated by the R-squared value.

Moving to the estimated coefficients of the explanatory variables, we find that they adhere to the a priori specification but lack individual statistical significance at the conventional 5% significance levels. For instance, ISB exhibits a coefficient of -0.000506, a t-statistic of -0.003114, and a p-value of 0.9975. This implies that a 1% increase in ISB, while keeping other variables constant, results in a negligible 0.03114% decrease in GDP. Similarly, ISBF boasts a coefficient of 0.034385, a t-statistic of 0.109757, and a p-value of 0.9138. A 1% increase in ISBF, holding other variables constant, leads to a 3.43% GDP increase, although this increase lacks statistical significance.

Likewise, ISBTA demonstrates a coefficient value of 0.212727, a t-statistic of 1.311759, and a p- value of 0.2061. A 1% increase in ISBTA, while other variables remain constant, results in a notable 21.27% increase in GDP, yet this increase also lacks statistical significance. The Durbin-Watson statistic registers at 1.96 in our analysis. In general, when the Durbin- Watson value equals 2, it indicates the absence of autocorrelation in the residuals. As the value approaches 0, it suggests evidence of positive autocorrelation (first-order) in the residuals. Conversely, when the value approaches 4, it signifies an issue of negative autocorrelation (second-order) in the residuals. Given our Durbin-Watson value of 1.96, we can confidently assert that our model is free from any form of autocorrelation. This underscores its reliability for making inferences.

Furthermore, the presence of cointegration among the variables requires the error correction term (ECT) coefficient to be negative and statistically significant. Our model meets this condition, with the one-period ECT coefficients being both negative (-0.043075) and highly statistically significant at the 5% level. The negative ECT coefficient signals the system's stability and its capacity to converge to long-run equilibrium after experiencing shocks or disturbances.

The value of -0.0430 indicates that approximately 4.30% of the disequilibrium is rectified within one year. However, it's important to note that the speed of adjustment appears sluggish, taking around 10 years on average to fully restore long-run equilibrium after

significant economic growth shocks. This observation aligns with the underdeveloped nature of Nigeria's Islamic bond markets, especially in the context of a developing economy like Nigeria.

Table 3: Long-Run Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.012544	0.453590	8.846185	0.0000
ISB	0.003856	0.155022	0.024871	0.9804
ISBTA	0.228802	0.151277	1.512472	0.1461
ISBF	0.013894	0.297334	0.046728	0.9632
R-squared	0.324339	Mean dependent var		4.572780
Adjusted R-squared	0.222989	S.D. dependent var		0.134190
S.E. of regression	0.118286	Akaike info criterion		-1.280411
Sum squared resid	0.279832	Schwarz criterion		-1.084068
Log likelihood	19.36493	Hannan-Quinn criter.		-1.228321
F-statistic	3.200208	Durbin-Watson stat		2.017258
Prob(F-statistic)	0.045458			

Dependent Variable: GDP; Method: Least Squares; Date: 07/27/24 Time:02:47
Sample (adjusted): 2017Q2 2022Q4; Included Observations: 24.
Source: Author's Analysis

Also, the model revealed that the result of the long-run regression for the model has R^2 value of 0.3243 which suggested a 32.43% explanatory ability of the independent variables (ISB, ISBTA, and ISBF) of the model for the systematic variations in the dependent variable (GDP) with an adjusted R^2 of 0.2229 (or 22.29%) which implies that even after adjusting for the degree of freedom the model could still explain about 22% of the total systematic variations in GDP, only about 2% of the systematic variation of the RGDP was left unaccounted for by the model which has been captured by the stochastic disturbance term in the model. It becomes evident that factors beyond housing financing variables remain unaccounted for by our model. The p-value of the F-statistic, standing at 0.04, suggests that we cannot reject the hypothesis of a significant linear relationship between the dependent and independent variables, even at the 1% significance level. This result aligns with the model's a priori expectations, given that the coefficients of the explanatory variables are all negative.

Moreover, the independent variables demonstrate significance at an acceptable level, affirming their relevance in influencing economic growth. However, the Durbin-Watson statistic hints at the presence of autocorrelation within the regression results. This is indicated by a Durbin- Watson value of 2.01, which implies that the residuals lack correlation (i.e., the absence of first- order autocorrelation among the

stochastic variables within the error term of the model). Also, the model revealed that the result of the long-run regression for the model has R^2 value of 0.3243 which suggested a 32.43% explanatory ability of the independent variables (ISB, ISBTA, and ISBF) of the model for the systematic variations in the dependent variable (GDP) with an adjusted R^2 of 0.2229 (or 22.29%) which implies that even after adjusting for the degree of freedom the model could still explain about 22% of the total systematic variations in GDP, only about 2% of the systematic variation of the RGDP was left unaccounted for by the model which has been captured by the stochastic disturbance term in the model. It becomes evident that factors beyond housing financing variables remain unaccounted for by our model. The p-value of the F-statistic, standing at 0.04, suggests that we cannot reject the hypothesis of a significant linear relationship between the dependent and independent variables, even at the 1% significance level. This result aligns with the model's a priori expectations, given that the coefficients of the explanatory variables are all negative.

Moreover, the independent variables demonstrate significance at an acceptable level, affirming their relevance in influencing economic growth. However, the Durbin-Watson statistic hints at the presence of autocorrelation within the regression results. This is indicated by a Durbin- Watson value of 2.01, which implies that the residuals lack correlation (i.e., the absence of first- order autocorrelation among the

stochastic variables within the error term of the model).

4.0 DISCUSSION OF FINDINGS

Empirical evidences from the hypothesis validation using the inferential statistics revealed three (3) complimentary results. First it was found out that Sukuk bonds have insignificant positive effects on the gross domestic products. Secondly, it was discovered that Islamic banks assets have insignificant positive effects on the gross domestic products. Thirdly, analytical evidence shows that Islamic funds have insignificant positive effects on the gross domestic products. This suggests that the quantum of Islamic finance products used by the government of Nigeria has weak effect on the overall economic performance. Put differently, although the use of Islamic finance products, funds and total assets have positive effect which indicates that the continuous usage – of Islamic finance – has the potential to provide a viable alternative financing for the government vis-a-vis the financing of critical infrastructural projects in the country, a sine qua non for sustainable economic progress.

This justifies the assertion of AbdulKareem, AbdulGaniyy, Mahmud, and Yazid (2020), that the Islamic finance products would maintain its significant contribution to economic growth and infrastructural development in the upcoming years. This will be achieved through the facilitation of financial services and the transformation of Islamic finance. Throughout history, the global and local financial markets have exerted a substantial influence on the proliferation of ethical-oriented debt financing by actively seeking out various channels for funding. In recent years, there has been an observable trend in Nigeria where both governmental and business institutions are increasingly utilising the capital markets as a method to raise funds from investors that display a specific inclination towards ethical-based debt products ('Sukuk').

However, the non-significance effect of theSukuk financing is attributable to its limited use, given the fact that it is just in 2017 that the Sukuk bond usage started in Nigeria, with aggregate Sukuk bond issued at ₦742.56 billion, between 2017-2022. Nevertheless, the economic significance of Sukuk bond especially with regards to capital projects development in Nigeria has been attested by several scholarly papers (Cavusoglu et al., 2019; Bakar & Baba, 2020; Sulaiman, 2020; Duku & Muhammad, 2022; Bala, Kaoje & Olarewaju, 2022; Alqatan, Nadia, Asma & El-Halaby, 2022; Ibrahim & Aliero, 2020; Ozili, 2022). The overall implication of these findings is that there is high prospect of Sukuk bond contribution to the Nigeria's economic growth in no distant time. For instance, by the end of the year 2022, it is estimated that the Nigerian Islamic finance industry will attain a market size of approximately USD2.9 billion. Sukuk holdings represent the predominant segment, comprising 57% of the overall composition. Islamic banks constitute 42% of the industry in terms of total assets, whereas the remaining 1% is allocated between Islamic funds, based on their total assets, and takaful, based on their total contributions. Nigeria possesses significant long-term potential attributable to its position as the African nation harbouring the largest Muslim populace, alongside a sizable segment of the population lacking access to formal banking services.

5.0 CONCLUSION

The findings of this study led to the conclusion that Sukuk bond has a good prospect of driving of economic growth in Nigeria. Specifically, the Sukuk as a feasible option for raising funds locally to fund, especially critical infrastructure projects, rather than relying on foreign loans to cover budget deficits. Also, if correct policy alternatives are pursued, Sukuk can be a viable option for funding large-scale infrastructure investments in Nigeria, capable of accelerating economic activities. In addition, this study concludes that plays a supply-leading role in Nigeria economy, by providing a viable alternative funding means to the government.

Islamic banking has successfully fulfilled its primary function as financial intermediaries, as it is directly connected to the actual sector of the economy and operates on the basis of physical transactions, specifically asset-based transactions. Therefore, it can be argued that the present policies implemented by the Central Bank of Nigeria, aimed at establishing a comprehensive Islamic financial system, are seen favourably due to the strong interconnection between the development of such a system and economic growth. It can be inferred that the provision of Islamic bank financing has an impact on Nigeria's economic growth, as it contributes to the increase in her real gross domestic product. Furthermore, the Nigerian government's intention to issue sovereign Sukuk in order to address the budget deficit is expected to attract substantial amounts of affordable capital from the Gulf Countries and other well-established Islamic markets worldwide. This influx of capital is anticipated to further enhance Nigeria's economic growth.

RECOMMENDATIONS

Based on the conclusions of this study, it is advised that: The government must quickly educate non-Muslims about Islamic finance products. Increased interaction with important religious bodies can do this. The goal is to investigate using Islamic finance products to fund Nigeria's deficit budget. This approach should improve capital market intermediation and encourage Islamic

finance products issuance as a reliable financing option. The government, regulators, and market participants must work together to promote Islamic finance products and by extension, Islamic finance, as a financing option, especially since Nigeria's external debt, often in US dollars, is expected to exceed ₦32 trillion by 2023.

The Nigerian government should urgently provide the needed enabling environments for the growth and development of Islamic finance in Nigeria, in other to accumulate more capital – from ethical-based sources – to grow the economy.

REFERENCES

Abdulkareem, I. A., Mahmud, M. S., & Abdulganiyy, A. (2021). Sukuk, infrastructural development and economic growth: a theoretical lens for abandoned projects in Nigeria. *Albukhary social business journal*, *2*(1), 23-35.

Abubakar, A. M., & Baba, I. M. (2020). Sukuk and nation building: A theoretical analysis of sukuk financing in Nigeria. *Jurnal Ekonomi dan Bisnis Islam*, *5*(1), 71-84.

Alhassan, A., Adamu, M. S., & Safiyanu, S. S. (2023). Finance-led growth hypothesis for Asia: an insight from new data. *Journal of the Asia Pacific Economy*, *28*(2), 599-618.

Alqatan, A., Nadia, S., Asma, S., & El-Halaby, S. (2022). Sukuk issuance and economic growth using fully modified least square model. *International Journal of Excellence in Islamic Banking & Finance*, *8*(1), 1-27.

Al-Raeai, A.M., Zainol, Z., Rahim, A.K. B A. & Khilmy, A. (2018). The role of macroeconomic factors on sukuk market development of Gulf Cooperation Council (GCC) countries. *International Journal of Economics and Financial Issues*, *EconJournals*, 8(3), 333-339.

Anthony-Orji, O. I., Orji, A., Ogbuabor, J. E., & Uka, L. C. (2023). Money matters a lot: empirical analysis of financial development, financial inclusion and economic growth in Nigeria. *International Journal of Economic Policy in Emerging Economies*, *17*(1), 100-117.

Bakar, A. A., & Baba, I. M. (2020). Sukuk and nation building: An overview of the development and impact of sukuk financing in Nigeria. *Ikonomika: Jurnal Ekonomi dan Bisnis Islam*, *5*(1), 71-84.

Bala, S. A., Kaoje, N. A., & Olarewaju, B. T. (2022). Sukuk as a viable option instrument of financing infrastructural development in Nigeria. *Gusau International Journal of Management and Social Sciences*, *5*(2), 17-17.

Bencivenga, V.R. & Smith, B.D. (1991). Financial intermediation and endogenous growth. *The Review of Economic Studies*, 58(2), 195-209.

Blackburn, K. & Hung, V.T.Y. (1998). A theory of growth, financial development and trade. *Economica*,
65(257), 107-124.

Boukhatem, J. & Moussa, F.B. (2018). The effect of Islamic banks on GDP growth: some evidence from selected MENA countries. *Borsa Istanbul Review*, 18(3), 231-247.

Cavusoglu, B., Ibrahim, S. S., & Ozdeser, H. (2019). Testing the relationship between financial sector output, employment and economic growth in North Cyprus. *Financial Innovation*, 5(1), 36-48.

Duku, M., & Muhammad, A. D. (2022). The effectiveness of sukuk ijarah in educational financing in Osun State, Nigeria: Lesson to other States. *Al Qasimia University Journal of Islamic Economics*, *2*(2), 153-188.

Echchabi, A., Aziz, H.A. and Idriss, U. (2016). Does sukuk financing promote economic growth? An emphasis on the major issuing countries. *Turkish Journal of Islamic Economics*, 3(2), 63-73.

Echchabi, A., Aziz, H.A. and Idriss, U. (2018). The impact of Sukuk financing on economic growth: the case of GCC countries. *International Journal of Financial Services Management*, 9(1), 60-69.

El-Morabit, F., Zaheer, S., Boussetta, M. & Achour, F. Z. (2023). The potential role of sukuk in promoting economic growth: Evidence from Malaysia and Bahrein. *Journal of Economics, Finance and Management Studies*, 6(1), 438-454.

Fanta, A.B. & Makina, D. (2017). Equity, bonds, institutional debt and economic growth: evidence from South Africa. *South African Journal of Economics*, 85(1), 86-97.

Fink, G., Haiss, P.R. & Hristoforova, S. (2003). Bond markets and economic growth. Social Science Research Network, Rochester, New York, NY, available at: https://doi.org/10.2139/ssrn.1003763

Hassan, M.K., Sanchez, B. & Yu, J.-S. (2011). Financial development and economic growth: new evidence from panel data. *The Quarterly Review of Economics and Finance*, 51(1), 88-104.

Ibrahim, M. L., & Mustapha, A. B. (2020). Islamic bond (sukuk) and petroleum infrastructure development in Nigeria. *In the Name of Allah, The most Beneficent, The most Merciful*, 44-57.

Jhingan, M.L. (2011). *The Economics of Development and Planning*. Vrinda Publications, Delhi.

Kamarudin, A. A., Duasa, J., Kassim, S., & Imon, R. A. (2023). Islamic capital market-growth nexus pre and post IFSA 2013: Empirical evidence from

Malaysia. *International Journal of Islamic Banking and Finance Research*, *11*(1), 20-34.

Kapingura, F. & Makhetha-Kosi, P. (2014). The causal relationship between the bond market development and economic growth in Africa: case study of South Africa. *Mediterranean Journal of Social Sciences*, 5(3), 126-135.

Kartini, E., & Milawati, M. (2020). How Sukuk and conventional bond affect economic growth?

Evidence from Indonesia. *International Journal of Economics and Financial Issues*, *10*(5), 77.

Kassim, S. (2016). Islamic finance and economic growth: the Malaysian experience. *Global Finance Journal*, 30, 66-76.

Ledhem M. A., & Mekidiche M. (2021). Islamic finance and economic growth nexus: An empirical evidence from Southeast Asia using dynamic panel one-step system GMM analysis. *Journal of Islamic Accounting and Business Research*, 12(8), 1165–1180.

Ledhem, M.A. (2022). Does Sukuk financing boost economic growth? Empirical evidence from Southeast Asia. *PSU Research Review*, 6(3), 141-157.

Levine, R. & Zervos, S. (1998). Stock markets, banks, and economic growth. *American Economic Review*, 88(3), 537-558.

Malikov, A. (2017). How do sovereign sukuk impact on the economic growth of developing countries? An analysis of the infrastructure sector in Efendić, V., Hadžić, F. and Izhar, H. (Eds), Critical issues and challenges in islamic economics and finance development. Springer International Publishing, Cham, pp. 1-37.

McKinnon, R.I. (1973). *Money and capital in economic development*. Brookings Institution Press. Mitsaliyandito, R.Q., Arundina, T. and Kasri, R.A. (2017). Impact of Sukuk market development on

Indonesian economic growth. *International Journal of Applied Business and Economic Research, Serials Publications*, 15(24), 537-549.

Naz, S. A., & Gulzar, S. (2022). Does the sukuk issuance boost economic growth? Evidence from selected Islamic economies. *Global Business Review*, 09721509221093894.

Ogunbado, A. F. (2019). Infrastructural development in Organisation of Islamic Cooperation (OIC) Member Countries: Sukuk Mode Financing as an Alternative. *'Abqari Journal*, *20*(2), 36-48.

Ozili, P. K. (2022). Green finance research around the world: A review of literature. *International Journal of Green Economics*, *16*(1), 56-75.

Pradhan, R.P., Zaki, D.B., Maradana, R.P., Dash, S., Jayakumar, M. & Chatterjee, D. (2015). Bond market development and economic growth: the G-20 experience. *Tékhne*, 13(1), 51-65.

Rajan, R.G. & Zingales, L. (1996). Financial Dependence and Growth. National Bureau of Economic Research.

Romer, D. (2011). *Endogenous growth*, *Advanced Macroeconomics, 4th ed.*, McGraw-Hill, New York, NY, pp. 101-149.

Saint-Paul, G. (1992). Technological choice, financial markets and economic development. *European Economic Review*, 36(4), 763-781.

Sari, N., Ak, S. & Widiyanti, M. (2018). The impact of Islamic capital market development on economic growth: the case of Indonesia. *Journal of Smart Economic Growth*, 3(2), 21-30.

Shaw, E.S. (1973). *Financial deepening in economic development.* Oxford University Press, New York, NY.

Smaoui, H. & Nechi, S. (2017). Does sukuk market development spur economic growth? *Research in International Business and Finance*, 41, 136-147.

Sulaiman, K. D. O. (2020). Customer's expectations in sukuk (islamic bond) and the question of islamization of Nigerian. *The islamic college university journal*, (55), 23-45.

Thumrongvit, P., Kim, Y. & Pyun, C.S. (2013). Linking the missing market: the effect of bond markets on economic growth. *International Review of Economics and Finance*, 27, 529-541.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

NEXUS BETWEEN EXCHANGE RATE FLUCTUATION AND BALANCE OF PAYMENTS IN PROMOTING SUSTAINABLE ECONOMIC DEVELOPMENT IN NIGERIA (1990-2022)

[1]Ajudua, Ifeanyi Emmanuel, [2]Adewale E. Adegoriola, [1]Vivian Anietem Odishika, [1]Zubair, A. Zulaihatu & [1]Olusanya, Samuel Olumuyiwa
[1]Department Economics, National Open University of Nigeria
[2]Department Economics, Federal University, Lafia, Nigeria
Corresponding Emails: ajuduaemmanuel@gmail.com; adegoriolae@gmail.com; vodishika@noun.edu.ng; zzubair@noun.edu.ng; biggypascaly@yahoo.com

ABSTRACT
The paper investigates the nexus between exchange rate fluctuation and the balance of payments in promoting sustainable economic development in Nigeria. The paper examines the impact of exchange rate, Gross Domestic product, inflation rate, and foreign direct investment (FDI) on Nigeria's balance of payments. It assesses how these factors influence the country's external economic stability. Johansen co-integration and error correction model was used as estimation techniques, and the findings show that the exchange rate and inflation rate do not significantly impact Nigeria's balance of payments, while GDP and foreign direct investment significantly improve it. The paper concludes that exchange rate fluctuations and inflation have little impact on Nigeria's balance of payments, while GDP growth and FDI significantly improve it. A focus on boosting GDP and attracting FDI is key to improving the balance of payments. The study recommends that we promote GDP growth and attract foreign direct investment by investing in key sectors and improving infrastructure. Maintain stable inflation and diversify exports to reduce oil dependency and enhance the balance of payments.

Keywords: *Balance of Payments, Exchange Rate, Foreign Direct Investment, Gross domestic product, inflation rate*
JEL Codes: F31, F41

1.0 INTRODUCTION

The study titled "Nexus between Exchange Rate Fluctuation and Balance of Payments in Promoting Sustainable Economic Development in Nigeria (1990–2022)" explores the intricate relationship between exchange rate movements, the balance of payments, and their combined impact on sustainable economic development in Nigeria. Given Nigeria's dependence on external trade, the economy is particularly vulnerable to the effects of exchange rate volatility, a persistent challenge over the years (Olayungbo & Adediran, 2017). The study covers the period from 1990 to 2022, a timeline marked by significant economic changes, including booms, downturns, policy adjustments, and global oil price fluctuations, all of which have influenced exchange rate trends and the balance of payments (Olokoyo et al., 2019).

Exchange rate fluctuations are a critical issue for Nigeria, affecting international trade, investment inflows, inflation, and overall economic stability (Adeniran et al., 2014). The balance of payments, which tracks economic transactions between Nigeria and the rest of the world, serves as a key indicator of financial health. Persistent imbalances in the balance of payments can impact currency value, foreign reserves, and sustainable growth prospects (Iheanacho, 2020).

The study seeks to assess how exchange rate fluctuations have influenced Nigeria's balance of payments over the past three decades and their implications for sustainable development (Balogun, 2021). Using historical data and econometric models, it aims to uncover causality and correlations between these variables. The findings are intended to guide policymakers and stakeholders in mitigating exchange rate volatility's adverse effects, stabilizing the balance of payments, and fostering sustainable economic growth (Oluwatosin & Taiwo, 2022).

Existing research has largely focused on the short-term impacts of exchange rate fluctuations, such as inflation and trade balances, without adequately addressing the long-term implications for sustainable development (Adeniran et al., 2014; Olayungbo & Adediran, 2017). Additionally, previous studies often examine specific economic periods or events, failing to capture the broader economic cycles and policy shifts that characterize the past three decades (Balogun, 2021). Many also lack detailed analyses of policy responses to mitigate the adverse effects of exchange rate volatility on balance of payments stability and sustainable development (Oluwatosin & Taiwo, 2022).

This study addresses these gaps by examining the long-term relationship between exchange rate fluctuations and

the balance of payments, offering insights essential for formulating policies that support sustainable development in Nigeria. Its findings are particularly relevant given the significant economic transformations Nigeria has experienced, providing a foundation for more effective macroeconomic strategies (Iheanacho, 2020; Olokoyo et al., 2019). Furthermore, the study contributes to the broader understanding of macroeconomic management in developing economies, offering lessons for other countries facing similar challenges. It evaluates the influence of exchange rate, GDP, inflation, and FDI on Nigeria's balance of payments to assess their roles in maintaining external economic stability.

2.0 REVIEW OF RELATED WORK

According to Ogunsanya (2024), exchange rate fluctuations occur when the value of one currency changes relative to another due to factors such as market dynamics, geopolitical events, and economic policies that influence the foreign exchange market. Similarly, Chukwu (2023) describes exchange rate fluctuations as the continual changes in a currency's value in the foreign exchange market, driven by variables like interest rates, inflation, and trade balances. Adedokun (2023) further defines exchange rate fluctuation as the unpredictability of currency values caused by economic shifts, investor sentiment, and government interventions.

Ibrahim (2022) highlights that exchange rate fluctuations result from variations in economic indicators, market speculation, and global financial trends. Likewise, Oluwole (2022) emphasizes that these fluctuations are driven by macroeconomic factors and the interplay of demand and supply in the foreign exchange market. Musa (2021) attributes exchange rate variations to economic policies, political stability, and international trade dynamics. Akinbode (2021) adds that the term "exchange rate fluctuation" captures changes in currency value influenced by inflation, economic growth, and global financial developments.

Definitions of the balance of payments also vary among scholars. Ajudua (2022) describes it as a comprehensive record of economic transactions between a country's residents and the rest of the world over a given period, encompassing trade, capital flows, and financial transfers. In contrast, Daramola (2023) views it as a systematic summary of all financial interactions between a nation's residents and non-residents, used to evaluate a country's economic activities and health. Oluwole (2023) interprets the balance of payments as a measure of a country's economic performance in the global context, considering elements like exports, imports, and investment flows. Okeke (2022) defines it as a statistical record of economic exchanges, tracking the inflows and outflows of goods, services, and capital. Nwachukwu (2023) frames it as a comprehensive account of trade balances, capital movements, and financial transactions, offering insights into a nation's economic position globally. Similarly, Johnson (2022) describes it as an encompassing framework that tracks a country's international monetary interactions, providing a deeper understanding of economic stability and balance.

Dornbusch's (2022) Monetary Model of Exchange Rate suggests that exchange rates are influenced by differences in national money supplies, interest rates, and inflation. The model underscores the significance of monetary policy and expectations about future economic conditions in shaping exchange rate movements. Taylor and Taylor (2023) refine the Purchasing Power Parity (PPP) theory by incorporating short-term deviations and market frictions, providing a nuanced perspective on exchange rate adjustments. Meanwhile, Chen et al.'s (2023) Behavioral Equilibrium Exchange Rate theory emphasizes long-term equilibrium conditions driven by productivity differences, trade balances, and net foreign assets, while also accounting for behavioral factors and market sentiments.

Frankel's (2022) asset portfolio theory links changes in a country's balance of payments to capital flows influenced by variations in returns on financial assets. Blanchard and Milesi-Ferretti's (2023) global imbalances theory attributes persistent balance of payment discrepancies to structural differences in savings, investments, and policies, calling for strategic adjustments to maintain global financial stability. De Grauwe and Ji's (2022) currency union theory examines the balance of payments within shared currency systems, stressing the need for mechanisms to manage imbalances and asymmetric shocks among member countries.

Dornbusch's Monetary Model closely ties exchange rate fluctuations and balance of payments, demonstrating how monetary factors like money supply and interest rates drive currency value changes. For example, an increase in the money supply relative to another country can depreciate a currency, affecting trade balances and the current account.

Empirical studies provide further insights. Adebayo (2023) utilized the ARDL model to examine exchange rate volatility's negative impact on Nigeria's economic growth, advocating for stabilization policies. Akinboade and Odhiambo (2023) applied a VAR analysis in South Africa, showing inflation's detrimental lagged effects on financial sector performance. Amoako and Boateng (2023), using fixed-effects panel data analysis,

highlighted the role of institutional quality in maximizing FDI's benefits for Ghana's development. Chen et al. (2023) employed a dynamic panel model to demonstrate how technological innovation enhances energy efficiency in China. Giwa and Olalekan (2023), using the ECM approach, identified public debt's long-term adverse effects on Sub-Saharan Africa's economic growth.

Other studies explored diverse contexts. Kumar and Singh (2023) used the GARCH model to link exchange rate movements to stock market volatility in India. Musa and Bassey (2023), applying VECM, examined the impact of energy prices on Nigeria's industrial production. Nwachukwu and Obi (2023) analyzed urbanization's effect on residential energy consumption with fixed-effects regression, while Ogunbiyi et al. (2023) used random-effects panel analysis to associate population growth with increased energy demand in Nigeria. Okoye (2023) applied an SVAR model to establish the effectiveness of monetary policy in controlling inflation in Kenya.

3.0. METHODOLOGY

3.1 DATA COLLECTION PROCEDURE

The study relied on data sourced from the 2023 Central Bank of Nigeria (CBN) Statistical Bulletin, primarily utilizing secondary data compiled in this publication. Accordingly, the research employs an ex post facto design, focusing on the period from 1980 to 2022. This methodological approach facilitates the examination of historical data to uncover trends and relationships over time.

3.2 MODEL SPECIFICATION

The model specification for the study is as follows:

$$BOP = (EXR, GDP, INF, FDI) \quad \ldots\ldots (1)$$

$$BOP = \beta_0 + \beta_1 EXR + \beta_2 GDP + \beta_3 INF + \beta_4 FDI + \epsilon t \quad \ldots\ldots (2)$$

Take the of equation 2

$$LNBOP = \beta_0 + \beta_1 LNEXR + \beta_2 LNGDP + \beta_3 LNINF + \beta_4 LNFDI + \epsilon t \quad \ldots\ldots (3)$$

Where:
BOP = Balance of Payments
EXR = Exchange Rate Fluctuation
GDP = Gross Domestic Product (proxy for economic growth)
INF = Inflation Rate at time
FDI = Foreign Direct Investment
ϵt *= Error term*

The apriori expectation is based on the expected signs of the coefficient of the explanatory variables, such as $\beta 1$, $\beta 3 < 0$ and $\beta 2$, $\beta 4 > 0$, respectively.

4.0 RESULT AND ANALYSIS

4.1. DESCRIPTIVE STATISTICS

Table 4.1 presents descriptive statistics for key variables in the study, including Exchange Rate (LNEXR), Gross Domestic Product (LNGDP), Inflation Rate (LNINF), and Foreign Direct Investment (LNFDI). These variables were analyzed to examine the impact of exchange rate fluctuations on Nigeria's balance of payments from 1990 to 2022. The analysis shows that LNGDP and LNEXR have relatively low variability, as reflected in their standard deviations. However, LNINF exhibits considerable variability, characterized by a wide range and high standard deviation, indicating significant fluctuations in inflation rates during the period. The LNFDI data reveal pronounced skewness and kurtosis, suggesting a distribution with a long right tail and a higher propensity for extreme values. These observations highlight that while LNGDP and LNEXR remain relatively stable, LNINF and LNFDI experience greater fluctuations, potentially influencing the balance of payments and Nigeria's broader economic stability. Additionally, the Jarque-Bera test results indicate that some variables, notably LNFDI, significantly deviate from a normal distribution, an aspect that must be addressed in subsequent econometric analyses.

Table 4.1. Descriptive Statistics

	LNEXR	LNGDP	LNINF	LNFDI
Mean	6.622191	7.899721	91.675331	85.889974
Median	6.122058	7.677543	89.129749	78.775885
Maximum	8.776925	8.112987	176.558115	179.798831
Minimum	2.112652	2.887994	0.918	8.76
Std. Dev.	2.331281	1.911287	99.811273	70.007785
Skewness	0.008972	0.911274	0.886351	3.665381
Kurtosis	3.678544	3.755641	5.008879	4.665322
Jarque-Bera	2.445117	4.897556	4.554116	91.88659
Probability	0.005641	0.001124	0.003321	0.000221
Observations	42	42	42	42

Source: Author's computation

4.2. UNIT ROOT TEST RESULT

The stationarity of the data was assessed using unit root tests, a crucial step in determining whether the data exhibits a consistent pattern over time. Stationary data displays predictable random behavior, often described as white noise. To ensure the reliability of the analysis, the Augmented Dickey-Fuller (ADF) test was employed to identify the order of integration for the time series data. The results are presented in Table 2.

Table 4.2. Augmented Dickey-Fuller Unit Root Test Result

Variables	ADF-Statistic	Critical Value			Order of integration
		1%	5%	10%	
LNBOP	-1.778634	-2.665711	-3.889215	-5.665112	1(1)
LNEXR	-3.675892	-4.778534	-5.764118	-5.712153	1(1)
LNGDP	-4.566414	-5.668891	-6.998114	-6.665418	1(1)
LNINF	-5.566487	-6.778912	-6.811265	-7.816529	1(1)
LNFDI	-6.611293	-6.882115	-7.776294	-7.711265	1(1)

Source: Author's Compilation Using E-views 8

The results of the Augmented Dickey-Fuller (ADF) unit root test show that all variables, including the balance of payments (BOP), exchange rate (EXR), gross domestic product (GDP), inflation rate (INF), and foreign direct investment (FDI), exhibit integration of order one, represented as I(1). We found each variable to be non-stationary at its levels, but it became stationary after first differencing. The ADF statistics for all variables are less negative than the 1%, 5%, and 10% critical values, confirming the need for first differencing to achieve stationarity. This outcome suggests that the time series data follows a consistent pattern over time only after differencing and it is suspected that there is a long-run relationship between the variables, therefore we will proceed to test for the long-run relationship.

4.3. JOHANSEN'S CO-INTEGRATION TEST RESULT

After establishing the non-stationarity of the data series, the next step involved evaluating whether the variables exhibit a long-term relationship. This was achieved using the Johansen co-integration test. The results, as shown in Table 4.3, confirm the presence of a long-term relationship among the variables.

Table 4.3: Johansen Co-Integration Test

Series	Eigen Value	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No of CE(S)
LNBOP	0.143127	155.7886	147.66	145.99	None**
LNEXR	0.698341	151.3194	144.22	142.71	At most 1
LNGDP	0.498173	148.9415	139.88	138.41	At most 2
LNINF	0.981428	144.4553	133.11	133.11	At most 3
LNFDI	0.665135	123.8417	127.67	128.55	At most 3

Source: Author's Computation
***(**) denotes rejection of the null hypothesis at the 5% (1%) level respectively**
L.R test indicates 2 co-integrating equation(s) at 5%

The Johansen co-integration test shows that, besides the Balance of Payments (BOP), the variables that were looked at Exchange Rate (EXR), Gross Domestic Product (GDP), Inflation Rate (INF), and Foreign Direct Investment (FDI) have strong long-term connections with each other. Specifically, EXR, GDP, INF, and FDI show multiple co-integrating relationships, indicating that these variables interact in long-term equilibrium. This analysis does not show a significant long-term relationship between the BOP. Therefore, since there is a long-run relationship between the variables, we will proceed to perform the error correction model.

4.4. ERROR CORRECTION MODEL

Table 4.4. Result of Error Correction Model

Variable	Co-efficient	Std. Error	T Statistic	Prob
Constant	0.921576	0.121769	7.568231	0.447
LNEXR	-0.700982	0.211100	3.362482	0.555
LNGDP	0.800217	0.512996	1.559889	0.001
LNINF	-0.634219	0.311002	2.039276	0.444
LNFDI	0.770083	0.894627	0.771363	0.003
R Squared	0.751786		F Statistics	41.74294
Adjusted R Squared	0.648743			
D/W	2.116426			
ECM (-1)	-0.680441	0.554198	1.227794	0.0001

Source: Arthurs computation from E-View Package

4.5. Interpretation of error correction result

The findings of the Error Correction Model (ECM) reveal that the exchange rate (EXR) has a negative but statistically insignificant effect on the dependent variable, indicating that fluctuations in the exchange rate do not exert a notable immediate impact. Conversely, LNGDP demonstrates a positive and statistically significant influence, underscoring its pivotal role in driving economic performance. Inflation (LNINF) shows a negative relationship; however, the effect is statistically insignificant, suggesting that its impact in this context is minimal.

Foreign Direct Investment (LNFDI), on the other hand, has a positive and significant effect, highlighting the beneficial role of FDI inflows on the dependent variable. The ECM (-1) term is negative and highly significant, indicating that short-term disequilibrium is corrected over time, leading the system back to long-term equilibrium. The model's high R-squared value (0.75) shows that a substantial portion of the variance is explained, while the Durbin-Watson statistic suggests no significant autocorrelation issues, further affirming the model's robustness.

4.6. Test of hypotheses

$H0_1$: Exchange rate has no significant impact on Balance of payment in Nigeria.

The error correction model demonstrates a negative relationship between exchange rate and balance of payment fluctuation in Nigeria, and the parameter exchange rate is not statistically significant. As a result, we accept the null hypothesis and conclude that exchange rate has no significant impact on Balance of payment in Nigeria.

$H0_2$: Gross domestic product has no significant impact on exchange rate fluctuation in Nigeria

The error correction model demonstrates a positive relationship between gross domestic product and balance of payment fluctuation in Nigeria, and the parameter gross domestic product is statistically significant. As a result, we reject the null hypothesis and conclude that

gross domestic product has a significant impact on Balance of payment in Nigeria.

H0$_3$: Inflation rate has no significant impact on exchange rate fluctuation in Nigeria
The error correction model demonstrates a negative relationship between inflation rate and balance of payment fluctuation in Nigeria, and the parameter inflation rate is not statistically significant. As a result, we accept the null hypothesis and conclude that inflation rate has no significant impact on Balance of payment in Nigeria.

H0$_4$: Foreign direct investment has no significant impact on exchange rate fluctuation in Nigeria
The error correction model demonstrates a positive relationship between foreign direct investment and balance of payment fluctuation in Nigeria, and the parameter foreign direct investment is statistically significant. As a result, we reject the null hypothesis and conclude that foreign direct investment has a significant impact on Balance of payment in Nigeria.

4.0 DISCUSSION OF FINDINGS

The study investigated the impact of exchange rate fluctuations on Nigeria's balance of payments between 1990 and 2022. The analysis revealed that while LNGDP and exchange rates exhibited relative stability, inflation and LNFDI experienced significant variability. The Augmented Dickey-Fuller (ADF) test results showed that all variables were initially non-stationary but became stationary after first differencing, indicating the presence of a long-run relationship among the variables. The Johansen co-integration test confirmed long-term associations between exchange rates, GDP, inflation, and LNFDI; however, it did not establish a significant relationship with the balance of payments. The results of the Error Correction Model (ECM) demonstrated that LNGDP and LNFDI exerted significant positive influences on the balance of payments, while exchange rates and inflation had no statistically significant effects.

In summary, LNGDP and LNFDI play a pivotal role in shaping Nigeria's balance of payments, whereas exchange rates and inflation appear to have a minimal impact.

5.0. CONCLUSION AND RECOMMENDATIONS

51. Conclusion

The study on the relationship between exchange rate fluctuations and the balance of payments in promoting sustainable economic development in Nigeria from 1990 to 2022 concluded that exchange rate variations do not significantly affect the country's balance of payments. This finding suggests that exchange rate changes alone may not be sufficient to drive improvements in Nigeria's external balance. However, the Gross Domestic Product (GDP), however, emerged as a critical factor, with a significant positive impact on the balance of payments, emphasizing the role of economic growth in achieving a favorable external balance. Similarly, Foreign Direct Investment (FDI) exhibited a significant positive influence, underscoring the importance of attracting investment to support external sector stability. In contrast, inflation rates showed no significant effect on the balance of payments. Therefore, the study's findings indicate that policies focusing on fostering GDP growth and increasing FDI inflows are essential for improving the balance of payments and achieving sustainable economic development in Nigeria. Meanwhile, exchange rate management and inflation control may have less direct influence on the country's external sector.

5.2. Recommendations

Based on the findings of the study, the following recommendations are suggested for the government:

1. **Promote Economic Growth**: Implement policies aimed at stimulating GDP growth by investing in key sectors such as agriculture and manufacturing. This would help boost exports and improve the balance of payments.
2. **Encourage FDI Inflows**: Foster a favorable environment for foreign direct investment by streamlining regulations and enhancing infrastructure. This would help strengthen the external sector and attract more investment.
3. **Maintain Stable Inflation**: Implement effective monetary policies to control inflation, ensuring long-term economic stability and boosting investor confidence.
4. **Diversify Exports**: Focus on supporting non-oil sectors to reduce reliance on oil revenues. Diversifying exports will help improve the balance of payments and enhance overall economic stability.

REFERENCES

Adedokun, K. (2023). Understanding Exchange Rate Fluctuations: A Review of Recent Theories. *Global Finance Review*, *36*(3), 89-104.

Adedokun, K. (2023). Understanding Exchange Rate Fluctuations: A Review of Recent Theories. *Global Finance Review*, *36*(3), 89-104.

Adeniran, J. O., Yusuf, S. A., & Adeyemi, O. A. (2014). The Impact of Exchange Rate Fluctuation on the Nigerian Economic Growth: An Empirical Investigation. *International Journal of*

Academic Research in Business and Social Sciences, *4*(8), 224-233.

Ajudua, O. (2022). Understanding the Balance of Payment: A Comprehensive Guide. *Economic Analysis Journal*, *45*(3), 102-118.

Akinbode, M. (2021). Exchange Rate Adjustments and Their Impact on Economic Growth. *Economic Development Quarterly*, *35*(3), 102-119.

Akinbode, M. (2021). Exchange Rate Adjustments and Their Impact on Economic Growth. *Economic Development Quarterly*, *35*(3), 102-119.

Balogun, E. D. (2021). Exchange Rate Volatility and Its Impact on Balance of Payments in Nigeria. *Journal of Economics and Sustainable Development*, *12*(3), 45-55.

Chen, X., Zhang, Y., & Wang, J. (2023). Behavioral Equilibrium Exchange Rate Models: Theory and Application. *Springer*.

Chukwu, S. (2023). The Dynamics of Exchange Rate Variability and Its Impact on Trade. *International Journal of Economic Policy*, *48*(1), 56-78.

Chukwu, S. (2023). The Dynamics of Exchange Rate Variability and Its Impact on Trade. *International Journal of Economic Policy*, *48*(1), 56-78

Daramola, S. (2023). A Review of Balance of Payment Accounting. *International Finance Review*, *58*(1), 25-39.
Eze, M. (2022). Global Transactions and the Balance of Payment: An Analytical Approach. *Journal of Economic Perspectives*, *31*(2), 88-104.

De Grauwe, P., & Ji, Y. (2022). The Economics of Currency Unions: Theory and Practice. *Oxford University Press.*

Dornbusch, R. (2022). Monetary Models of Exchange Rate. *Cambridge University Press.*
Taylor, A. M., & Taylor, M. P. (2023). Purchasing Power Parity and Exchange Rate Dynamics. *Oxford University Press.*

Frankel, J. (2022). Portfolio Balance Models and Exchange Rate Determination. *Cambridge University Press.*
Blanchard, O., & Milesi-Ferretti, G. M. (2023). Global Imbalances and the Financial Crisis. *IMF Economic Review*, *71*(1), 33-55.

Ibrahim, N. (2022). Exchange Rate Volatility and Its Economic Implications. *Development Economics Journal*, *27*(4), 223-240.

Ibrahim, N. (2022). Exchange Rate Volatility and Its Economic Implications. *Development Economics Journal*, *27*(4), 223-240.

Iheanacho, E. (2020). Balance of Payments, Exchange Rate, and Economic Growth in Nigeria: Evidence from ARDL Approach. *Cogent Economics & Finance*, *8*(1), 1743701.

Johnson, K. (2022). Comprehensive Accounting of International Financial Flows: The Balance of Payment. *Journal of International Economics*, *39*(2), 140-157.

Musa, J. (2021). Effects of Exchange Rate Fluctuations on Investment Decisions. *International Business Review*, *29*(1), 78-95.

Musa, J. (2021). Effects of Exchange Rate Fluctuations on Investment Decisions. *International Business Review*, *29*(1), 78-95.

Nwachukwu, J. (2023). The Balance of Payment and Its Economic Implications. *Economic and Financial Review*, *41*(1), 75-89.

Ogunsanya, T. (2024). Exchange Rate Fluctuations and Economic Stability in Emerging Markets. *Journal of Financial Economics*, *59*(2), 112-130.

Ogunsanya, T. (2024). Exchange Rate Fluctuations and Economic Stability in Emerging Markets. *Journal of Financial Economics*, *59*(2), 112-130.

Okeke, I. (2022). Tracking International Economic Transactions: The Balance of Payment Explained. *Global Trade Review*, *29*(3), 56-72.

Olayungbo, D. O., & Adediran, I. A. (2017). Effects of Exchange Rate Volatility on Sectoral Output Growth in Nigeria. *Global Journal of Emerging Market Economies*, *9*(1), 33-52.

Olokoyo, F. O., Osabuohien, E. S., & Salami, A. O. (2019). An Empirical Analysis of the Nexus Between Exchange Rate and Economic Growth in Nigeria. *African Journal of Economic Review*, *7*(1), 95-109.

Oluwatosin, O. F., & Taiwo, O. O. (2022). Exchange Rate Fluctuations and Its Impact on the Balance of Payments in Nigeria: An Econometric Investigation. *International Journal of Development and Economic Sustainability*, *10*(2), 39-50.

Oluwole, A. (2022). The Role of Exchange Rate Movements in Financial Markets. *Journal of Applied Economics*, *50*(2), 145-162.

Oluwole, A. (2022). The Role of Exchange Rate Movements in Financial Markets. *Journal of Applied Economics*, *50*(2), 145-162.

Oluwole, A. (2023). Economic Metrics and the Balance of Payment. *Finance and Development Studies*, *17*(4), 202-218.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

Climate Change and Health: A Public Health Concern

Florence Ngozi Uchendu
Department of Public Health, Faculty of Health Sciences, National Open University of Nigeria, Jabi, Abuja. Email: florenceuchendu@gmail.com;fuchendu@noun.edu.ng; +2348037065874

ABSTRACT
Poor health is a global public health concern and is being aggravated by climate change. Climate change affects the health of both humans and aquatic animals. This paper explores the consequences of climate change on health and its mitigation strategies. Search words such as; "climate change", "health", "risk factors", "consequences" and "mitigation" were used in searches on Google and other climate change-related journals. Climate change is caused by methane and carbon-dioxide emissions due to activities like coal use, deforestation, industrial processes, transportation, agriculture and gas flaring. These emissions lead to more frequent and severe weather including storms, extreme heat, floods, droughts and wildfires all of which have direct and indirect hazardous effects on health. These include increased health emergencies, hunger, food insecurity, malnutrition, non-communicable diseases, water-scarcity, spread of communicable-diseases and deaths. Climate change impacts all aspects of health, from clean air and water to food systems and livelihoods. It disrupts food production, increases poverty and contributes to zoonotic, food-, water- and vector-borne diseases as well as mental health issues. Vulnerable populations, including children, women, ethnic minorities, low-income communities, migrants/displaced persons, older adults and those with preexisting health conditions are particularly at risk. Delaying actions on climate change will exacerbate health risks, increase disease morbidity and mortality rates, undermine global health progress and violate the human right to health. Mitigation efforts should focus on reducing carbon emissions and improving health outcomes, and building more climate-resilient, environmentally sustainable health systems.

Keywords: *Climate change, consequences, health, mitigation strategies, risk factors*

1.0 INTRODUCTION

Climate change exerts significant strains on health systems, simultaneously increasing demand for health services whilst also impairing the system's ability to respond (World Bank, 2024). In the global risks ranking by severity over the short and long-term (2-year and 10-year periods), four aspects of climate change occupy the top four positions in the long term, with climate action failure expected to dominate the next decade (WEF), 2024). These climate change-related global risks include failure to mitigate climate change, failure of climate change adaptation, natural disasters and extreme weather events, and biodiversity losses and ecosystem collapse (WEF, 2024). It has been reported that the climate crisis is rapidly worsening access to basic human needs such as; food security, safe drinking water, sanitation, and clean air. Consequently, a warmer climate could cause at least 21 million additional deaths by 2050 due to five health risks; extreme heat, stunting, diarrhoea, malaria, and dengue (World Bank, 2024). These health risks are climate change related and so will be exacerbated by climate change if not checked. The direct damage costs to health associated with climate change is estimated to be between US$ 2–4 billion per year by 2030 (WHO, 2023a).

Climate change is caused by the release of billions of tons of heat-trapping gases known as greenhouse gases (GHGs) into the atmosphere. This depletes the ozone layer and increases earth's surface temperature through direct heating by the sun (Okoli and Ifeakor, 2014).
These GHGs include carbon dioxide (CO2), methane, nitrous oxide (NO2) and fluorinated gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3) (US Environmental Protection Agency, 2021).
The U.S. Greenhouse Gas Emissions by Gas from 1990–2019 is shown in Figure 1. The volume of carbon dioxide emitted is between 1,000-5,000 metric tons, and methane is 5,000 – 6,000 metric tons of carbon dioxide equivalent. The highest emissions are from F-gases, emitting about 6,500 metric tons of carbon dioxide equivalent. F-gases are man-made and pass a high global warming potential, often thousands of times stronger than carbon dioxide (European Parliament, 2023). They are usually used as substitutes for ozone-depleting substances. While carbon dioxide (CO2) is the most well-known GHG, others, though present in smaller quantities, can have a significantly greater warming effect (European Parliament, 2023). Many greenhouse gases such as CO2, methane, and NO2 occur naturally in the atmosphere, but human activity has increased their levels beyond natural

limits. Consequently, this enhanced greenhouse effect alters our planet's climate, causing shifts in snow and rainfall patterns, rising average temperatures and more extreme climate events such as heatwaves and floods (European Parliament, 2023).

Climate change and ozone depletion are affecting health. The ozone layer is a protective shield to life on earth, preventing much of the sun's ultraviolet (UV) radiation; especially UV radiation with shorter wavelengths from reaching the Earth. Consequently, any change in the atmospheric concentration of the ozone causes changes in the radioactive levels. Since the industrial revolution, human activities have increased the atmospheric concentration of greenhouse gases (GHGs). The photochemical reactions involving greenhouse gases and ozone are key contributors to the greenhouse effect, significantly depleting the protective ozone layer. This depletion has cascading effects, including increased external heat, air and water pollution, reduced food and water quality, shifts in infectious diseases and vector transmission, and increased allergen levels (NIH/NIEH, 2022). Climate change has brought about drastic environmental shifts, including rising global temperatures—global warming—along with extreme weather events, precipitation extremes, sea level rise, and altered land use and growing seasons (NIH/NIEH, 2022). The world is currently warming at an unprecedented rate in human history, mainly due to the burning of fossil fuels. Without urgent action to reduce carbon emissions, global temperatures are predicted to exceed the 1.5˚C limit set by the Paris Climate Agreement, potentially leading to over 3˚C of warming by the end of the century (Climate Change, 2021). The health impacts of climate change include heat-related illness; cardiovascular diseases (CVDs) and other chronic conditions; injuries and death; mental and neurological disorders; zoonotic, vector- and water-borne diseases and respiratory diseases (NIH/NIEH, 2022). Understanding the causes and health consequences of climate change is necessary for effective solutions (Jones & Smith, 2024). This study therefore aims at discussing the impact of climate change on health, as a global public health concern.

Human Activities as Causative Agents of Climate Change

Human activities have been the main driver of climate change (United Nations, 2022). Human activities increase the earth's natural greenhouse effect by increasing the concentration of energy-trapping gases in the lower atmosphere. Carbon dioxide is the primary greenhouse gas (GHG) emitted by human activities and accounted for almost three-quarters of global GHG emissions in 2022. The main sources of CO_2 emissions are fossil fuel combustion from transportation and power generation. Meanwhile, methane contributed 21 percent to total GHG emissions. Although CO_2 is the most abundant GHG, methane has a higher global warming potential (GWP). Over 100 years, the GWP of methane is almost 30 times greater than that of CO_2 (Tiseo, 2023b). Human activities such as agriculture, responsible for 30% greenhouse emissions and livestock, which accounts for 14.5% are major contributors to climate change (Ajilogba and Walker, 2021). Only half of all carbon dioxide emissions from human activities have remained in the atmosphere, leading to planet warming and other climate changes. The rest of the emissions have been removed in equal parts by the ocean and land (vegetation and soil), thus slowing down the pace of climate change (Global Carbon Atlas, 2024). Humans have a long history of releasing carbon dioxide into the atmosphere through multiple activities, beginning with deforestation. Around 1750, the Industrial Revolution began with the invention of steam power, launching an era of unprecedented carbon dioxide release into the atmosphere. With the industrial use of fossil fuels, first coal, then oil and gas, emissions have grown exponentially (Global Carbon Atlas, 2024). Deforestation, including burning and clearing forests, releases 40 billion metric tons of carbon dioxide annually. This amount of carbon is more than the normal level the natural processes can remove and so, atmospheric carbon-dioxide increases and accumulates each year (Lindsey and Dahlman, 2022). The emissions from burning fossil fuels trap heat in the atmosphere, effectively acting as a blanket that raises global temperatures (United Nations, 2022). Other causes of climate change include landfills which is a major source of methane emissions; energy, industry, transport, buildings and land use; gas flaring and fumes from rickety vehicles, tyres and generators (Uchendu, 2022). Human activities lead to significant air pollution releasing toxic chemicals such as sulfur dioxide (SO2), nitrogen oxide (NO), fine particulate matter, heavy metals like lead and chlorofluorocarbon and coliform bacteria (WHO, 2003). The healthcare sector is also a significant contributor to climate change, responsible for approximately 5% of global carbon emissions (Climate Change, 2022). Regionally, Asia is the largest producer of CO2, followed by North America, Europe, Central & South America, Africa, Oceania and the Middle East. North America and Europe are responsible for half of all carbon dioxide emitted since the beginning of the Industrial Revolution. The emerging economies of China

and India account for 14%, while the rest come from the remaining 150-plus countries (Global Carbon Atlas, 2024). Figure 1 shows the top 15 CO2-emitting countries. China is the highest CO2 emitting country followed by the United States of America.

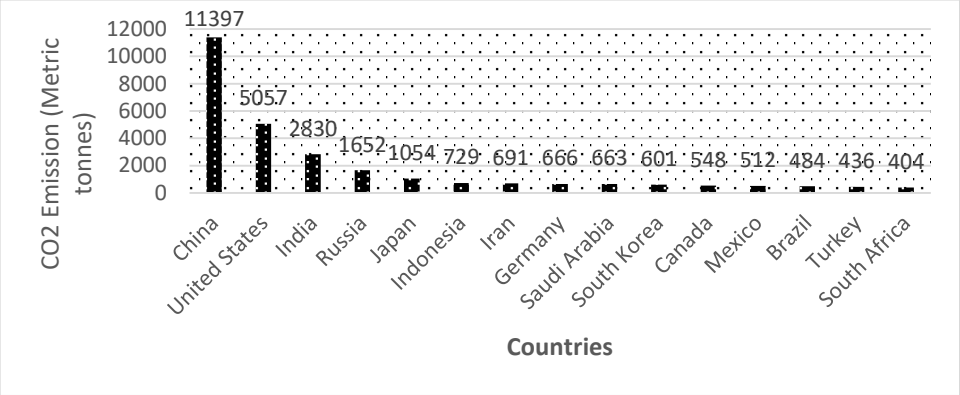


Figure 1: Top 15 CO2 Emitting Countries

Source: Global Carbon Atlas, (2024)

Figure 2 shows the 14 highest carbon dioxide (CO2) emissions in African Countries. South Africa emits the highest CO2 while Nigeria is the 4th African country that emits the highest CO2 into the atmosphere.

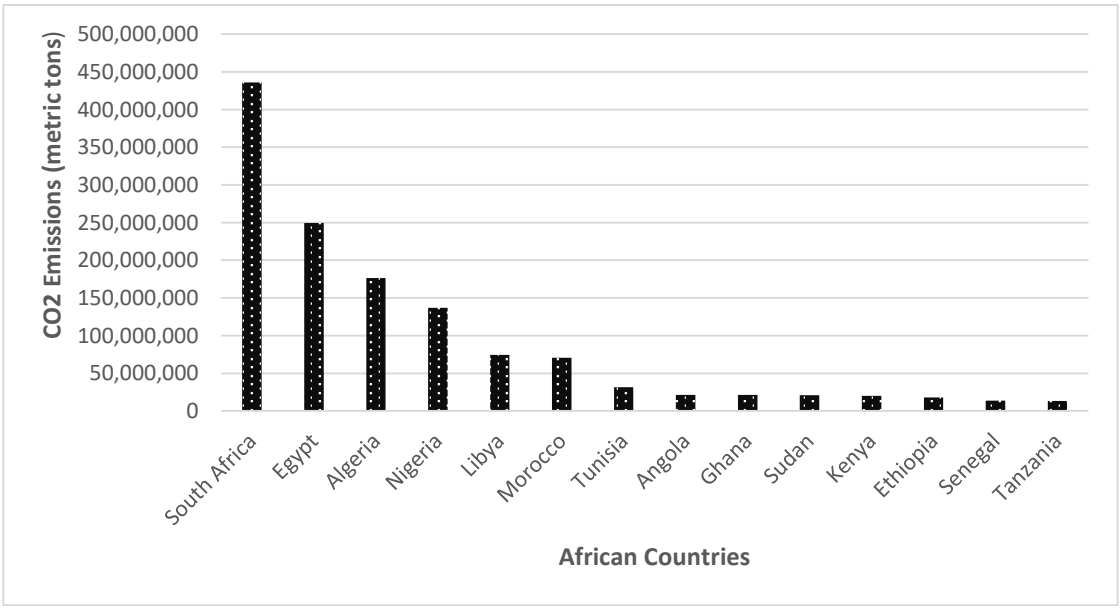


Figure 2: Carbon dioxide (CO2) Emissions in African Countries
Source: Galal, (2024)

Table 1 shows the sources of GHGs emissions. About 90% of carbon dioxide emissions are caused by the use of fossil fuels (Blokhin, 2024). These include animal respiration which releases CO2 into the atmosphere. Humans respire and release CO2 so a high population might be one of the contributors of GHGs. Consequently, for highly populated countries, their population might be one of their sources of carbon dioxide (CO2) in the atmosphere. Carbon dioxide (CO2) is also produced through chemical reactions, generators and old vehicles emit poisonous carbon monoxide (CO) into the atmosphere. Once the CO comes in contact with the atmospheric oxygen (O2), a chemical reaction takes place forming carbon dioxide.

Table 1: Sources of Green House Gases into the Atmosphere

Green House Gases (GHGs)	Source	Reference
Carbon dioxide (CO_2) -	Carbon dioxide emissions are from two major sources. The burning of fossil fuels (oil, gas, coal) is responsible for two-thirds of the emissions of carbon dioxide since the beginning of the Industrial Revolution. The second source comes from the conversion of land, mainly from forests to pastures and croplands. Others include cement production and gas flaring. Power, industries and boilers that burn fossil fuels for energy release large amounts of CO2 into the atmosphere*; Transportation that burns petroleum/oil (gasoline and diesel) for trucks, ships, trains, planes, motor vehicles and generators**; Agriculture (animal respiration; deforestation); and chemical reactions for the production of goods such as cement from raw materials; Coal*** Plants remove CO2 by absorbing it from the atmosphere as a part of biological carbon cycle through photosynthesis which turns sunlight into energy and also transforms CO2 and water into sugar and oxygen. CO2 is kept away from the atmosphere until plants die and this is why forests are very important in the capturing of carbon. This is also why deforestation is discouraged.	Statista, (2024a); Tiseo, (2023b); Blokhin, (2024); Global Carbon Atlas, (2024).
Methane (CH4)	Main components of natural gas; production and transportation of coal, natural gas & oil; livestock; fishing; land use; decay of organic waste in landfills and agricultural practices plus forestry. The main sources of methane emissions are landfills, enteric fermentation and natural gas systems.	Tiseo, 2023a; 2023b Statista, (2024a)
Nitrous oxide (N_2O)	Mainly produced as a result of microbial action in the soil; use of fertilisers containing nitrogen; burning of timber; land use, transportation, chemical production; agricultural & industrial activities; land use; combustion of fossil fuels & solid waste and treatment of wastewater. Globally, 40% of total N2O emissions come from human activities.	United States Environmental Protection Agency, 2024; IPCC, 2021
Hydrofluoro-carbons (HFCs)	Hydrofluorocarbons represent about 90% of the fluorinated gas emissions and the EU is working to phase them out by 2050. They are mainly used to absorb heat in refrigerators, freezers, air conditioners and heat pumps. They are also used as propellants in asthma sprays and technical aerosol spray cans and as blowing agents for foams and in fire extinguishers. In 2021, they were mostly used in the wholesale and retail trade, repair of motor vehicles and motorcycles sectors.	United States Environmental Protection Agency, 2024;
Perfluoro-carbons (PFCs)	Man-made compounds commonly used in industrial manufacturing processes.	United States Environmental Protection Agency, 2024
Sulfur hexafluoride (SF6)	Man-made compounds commonly used in the insulation of power lines.	United States Environmental Protection Agency, 2024
Nitrogen trifluoride (NF3)	Man-made compounds used as a chamber-cleaning gas in production processes to clean unwanted build-ups on microprocessor and circuit parts as they are being constructed. Also used in and emitted from electronics manufacturing.	United States Environmental Protection Agency, 2024
*largest CO2 source in China; **USA & Japan; ***India, Russia & Japan		

2.0 HEALTH IMPACTS OF CLIMATE CHANGE

Globally, the health impact of climate change affects countries, communities and populations in different and unequal ways, direct and indirect ways too (NIH/NIEH, 2023a). Climate fluctuations often coincide with other health stressors, such as poverty, social disadvantage, and impaired language ability which increases vulnerability (NIH/NIEH, 2023f). Climate change negatively impacts on the health of humans, animals and plants. The Sixth Assessment Report of the Intergovernmental Panel on climate change concluded that climate change is having a global adverse negative impact on human health and well-being through heat, malnutrition, infectious diseases, mental health and displacement. Climate shocks and growing stresses, such as drought and rising sea levels, are undermining the environmental and social determinants of physical and mental health, from clean air and water to sustainable food systems and livelihoods thus threatening the existence of some nations (Climate Change, 2022).

The Sixth Assessment Report estimates that up to 3.6 billion people live in contexts that are highly vulnerable to the impacts of climate change (Climate Change, 2022). The most vulnerable groups to the negative impacts of climate change are the poor, the elderly, women, children, indigenous peoples, outdoor workers, socially isolated individuals and those with pre-existing medical conditions (Climate change, 2022). The health impact of climate change includes heat-related illnesses; cardiovascular diseases and other chronic conditions; Zoonotic, vector-and water-borne diseases and respiratory diseases and asthma (NIH/NIEH, 2022).

2.1 Heat-related illnesses associated with climate change

GHGs like CO_2, methane, and nitrous oxide trap heat radiating from the planet's surface, preventing it from escaping into space. This causes Earth's atmosphere to heat and increases sea surface temperatures. Higher surface temperatures can unleash severe weather conditions such as extreme heat, droughts, and a higher frequency of high-intensity tropical storms (Tiseo, 2024). Rising temperatures have led to increase in the distribution of weeds, pests and diseases posing threats to aquatic life, plants, animals and humans (Ajiogba and Walker, 2021). Heatwaves and extreme cold events caused by climate change have direct impact on health. Table 2 shows the heatwave-related deaths in some developed countries in 2003. Excess mortality from heatwaves is mainly due to cardiovascular, cerebrovascular and respiratory conditions with the elderly being particularly affected (Haines et al. 2006). Heat-related deaths among those over 65 years have risen by 70 % in two decades (WHO, 2023a). Extreme heat can lead to exhaustion, dehydration, heat cramps, heat stroke, and heat-related death. People with chronic lung or heart illnesses or other conditions are at greater risk of heat-related complications or death (NIH/NIEH, 2023e).

Table 2: Heatwave-related deaths in some developed countries in 2003

Period of Heatwave	Country	Excess mortality (% increase)	%
2003 (4–13 August)	England and Wales	2091	17
2003 (1 June–15 August)	Italy (in all Italian capitals)	3134	15
2003 (1–20 August)	France	14,802	60
2003 August	Portugal	1854	40
2003 July and August	Spain	4151	11
2003 (June–September)	Switzerland	975	6.9
2003 (June–September)	Netherlands	1400–2200	3 - 5
2003 (1–24 August)	Germany	1410	

Source: Hainesa et al. (2006)

2.2 Cardiovascular Diseases

There are clear links between climate, poverty and health. The climate crisis acts as a health-risk multiplier. By 2030, climate's negative health effects could drive 40 million people into extreme poverty (World Bank, 2024). A recent World Bank study estimates that by 2030, climate change could push an additional 132 million people into extreme poverty with more than half living in Sub-Saharan Africa and South Asia, with 44 million of these driven by health impacts (World Bank, 2024). Poverty is a major risk factor of cardiovascular diseases and other chronic conditions because it leads to poor dietary intake and dietary diversity prioritising quantity over quality of food.

Climate change adversely affects food systems by disrupting food production, availability, accessibility and contamination leading to food spoilage, waste and food insecurity. It increases food and water-borne disease risks in many ways as many pathogens, especially those causing cholera, are sensitive to changes in temperature, rainfall and extreme weather. These changes lead to changes in pathogen growth, survival and virulence and crop contamination by feaces from high levels of rainfall and flooding.

One of the basic needs of man is food. Climate change leads to higher food prices and increased volatility in agricultural markets, reducing food supply, availability and access, resulting in food insecurity. This causes food shortage, scarcity and high cost of food thus causing global and national hunger. About 9.8% of the world population and 14.6% of Nigerians are hungry (Macrotrends, 2022). Flooding leads to the death of fish and food animals while drought leads to the death of fruits, vegetables, and crops further causing food insecurity. Fisheries and aquaculture contribute more than 20% to the dietary animal protein of nearly 1.5 billion people (Noble et al. 2014). Climate change disrupts food availability, accessibility, utilisation and stability, leading to hunger and food insecurity which can drive increase in crimes and social unrest. Excessive prolonged hunger results in poor dietary intake and dietary diversification which precipitates malnutrition in various shades. There is an overall reduction in the production of rice and wheat due to water shortage because of climate change. Prolonged hunger and food insecurity result in undernourishment and malnutrition and other chronic conditions such as hypertension, stroke, diabetes, low life-expectancy and death. A recent study reported that hunger influenced life expectancy in war-torn Sub-Sahara African (SSA) Countries (Uchendu, 2018). Globally, losses due to floods and droughts have been estimated to be about 100 billion dollars between 2004 and 2014 (FAO, 2015; Brida et al. 2013).

2.3 Injuries and death

It has been estimated that between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from undernutrition, malaria, diarrhoea and heat stress alone (WHO, 2024). It has been reported that mortality from floods, droughts and storms was 15 times higher in highly climate change vulnerable regions compared to regions with very low vulnerability (Climate Change, 2022). Polluting energy systems are the major cause of almost seven million premature deaths per year from air pollution. Table 3 shows the devastating impacts of flood in some developed countries. The WHO conservatively projects 250, 000 additional yearly deaths by the 2030 due to climate change impacts on diseases like malaria and coastal flooding (WHO, 2023a).

Table 3: Devastating Impacts of Climate Change in some developed countries

Flooding	Location	Devastating Impacts
1988	Nimes region of France	45,000 homes damaged >1100 vehicles destroyed 9 deaths by drowning 3 severe injuries
1977	River in Central Europe	200,000 people homeless >100 people were killed.
1996	Biescas in Spain	86 deaths
In recent years	Rivers Meuse, Rhine, Elbe and Danube in Central Europe	destroyed hospitals ≥1300 deaths ≈ 2000 injuries >1million displaced people from Hurricane Katrina
2002	Dresden, Germany	Left large parts of the city without power and fresh water for several days

Source: Hainesa et al. (2006)

Figure 3 shows the distribution of reported economic losses due to natural disasters in Africa between 1970 and 2019 and the type. Storms (37%) and flooding (34%) resulted in the highest economic losses in Africa from 1970 -2019.

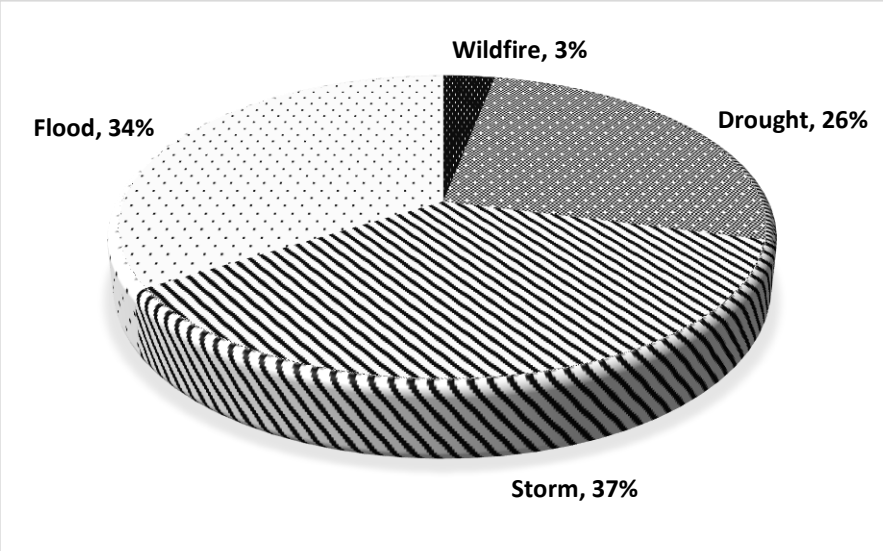


Figure 3: Distribution of reported economic losses due to natural disasters in Africa between 1970 and 2019, by type
Source: Statista, (2024b)

Figure 4 shows the largest natural disasters recorded in Africa between 1970 and 2019. The drought that took place in Ethiopia in 1983 resulted in 300,000 deaths.

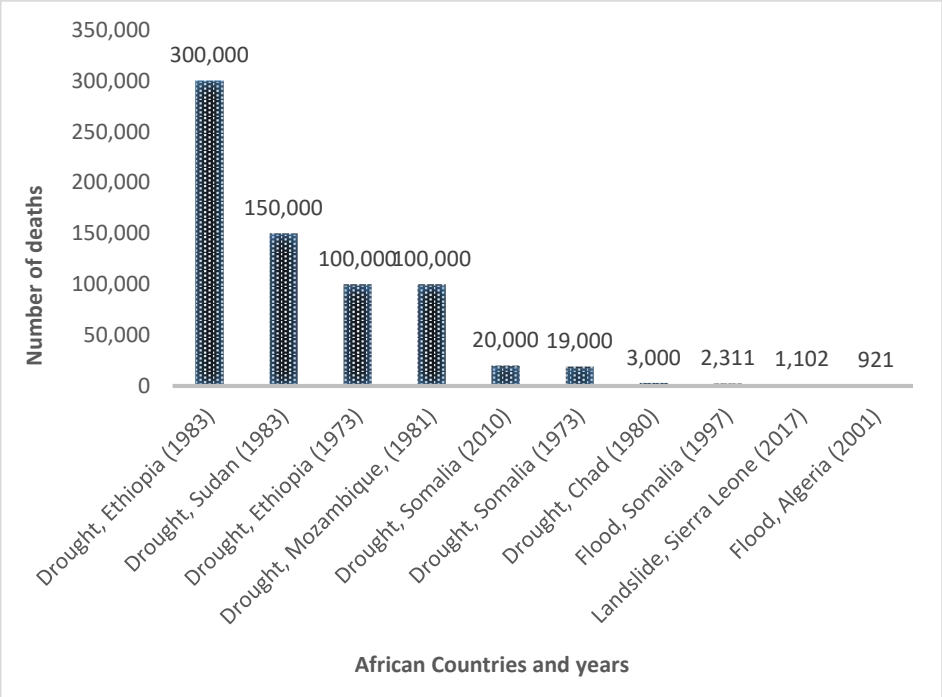


Figure 4: Largest natural disasters in Africa between 1970 and 2019, by number of deaths.
Source: Statista, (2024c)

2.4 Mental and Neurological Disorders

Climate change affects individuals emotionally and psychologically (Noble, et al. 2014). For example, in Australia, extreme events such as floods, drought, and bushfires have been linked to mental suffering, including post-traumatic stress disorder, resulting in the need for psychological support and counseling (Climate change, 2021). Also, drought has been associated with an 8% increase in suicide rates (Nicholls et al., 2006).

2.5 Zoonotic, Vector-and Water-borne Diseases

Rising sea surface temperature, changes in frequency and intensity of precipitation, as well as agricultural and industrial runoff from more frequent storms, can create conditions for pathogens to thrive and contaminate bodies of water. These contaminants include bacteria, alga, viruses, protozoa, and toxins, and exposure to them through ingestion, inhalation, or direct contact can cause water-related illnesses such as vibriosis, communicable diseases and death of aquatic animals that provide food for humans such as fishes. (NIH/NIEH, 2023c). This runoff results in human exposure to water-related illnesses primarily through contaminated drinking water, recreational water, and seafoods (NIH/NIEH, 2023d). Climate change results in eutrophication which is an over-abundance of nutrients coming from runoffs contaminated with fertilisers and pesticides and this leads to ocean acidification which is the excess absorption of carbon dioxide and this not only affects marine ecosystems but also influences the growth of harmful algal species (NIH/NIEH, 2023d). Flooding can overwhelm sewage treatment facilities leading to the growth of bacteria like Legionella and *Escherichia coli* (*E. coli*) in stagnant water and unused pipes (NIH/NIEH, 2023d). Swimming or fishing in contaminated water and consumption of affected seafoods are the most common ways of exposure to water-borne infections such as diarrhoea, giardiasis, dysentery, typhoid fever, *E. Coli* infection, mould and salmonellosis. Adverse health effects include gastrointestinal pain, reproductive, neurological systems, and other symptoms (NIH/NIEH, 2023d). Exposure to mould spores can cause headaches and eye, nose, and throat irritation (NIH/NIEH, 2023e). Hurricanes and coastal storms cause injury and increase the potential for hazardous chemicals and water-and vector-borne pathogens to spread due to facility damage, storm surge, and flooding (NIH/NIEH, 2023e). Climate change is already impacting on pollination, pest, and disease regulation, climate regulation services; and potable water supply (Noble et al. 2014). Climate change increases the presence of vectors like mosquitoes, ticks, and fleas, which can carry infective pathogens, such as viruses, bacteria, protozoa, and parasitic worms leading to high incidences of malaria and worm infestations (NIH/NIEH, 2023d). Long-term climate changes are expanding the geographic range and distribution of vectors, allowing species to inhabit and thrive in new areas. These vector diseases include dengue, malaria, chikungunya, yellow fever, and Zika from mosquitoes; Lyme disease from ticks; plague from fleas; and schistosomiasis from aquatic snails. Diseases symptoms include headache, pain, fatigue, dengue hemorrhagic fever (DHF), encephalitis, and nausea. Water scarcity during droughts can adversely affect hygiene and sanitation (WASH) and these lead to communicable diseases. Table 4 shows examples of vector-borne diseases likely to be sensitive to climate change.

Table 4: Examples of vector-borne diseases likely to be sensitive to climate change

Vector	Major diseases
Mosquitoes	Malaria, filariasis, dengue fever, yellow fever and West Nile fever
Sandflies	Leishmaniasis
Triatomines	Chagas disease
Ixodes ticks	Lyme disease and tick-borne encephalitis
Tsetse flies	African trypanosomiasis
Blackflies	Onchocerciasis
Snails (intermediate host)	Schistosomiasis

Source: Hainesa et al. 2006

2.6 Respiratory Diseases and Asthma

Climate change affects air quality by increasing and distributing air pollutants, such as ground-level ozone, fine particulates, wildfire smoke, small ants and dust. Seasonal weather changes (drought, whirlwind, hurricane) also impact on the production, distribution, and severity of airborne allergens (NIH/NIEH, 2023b). Exposure to ozone and particulate pollution exposure includes chest pain, coughing, throat irritation, congestion, and reduced lung function (NIH/NIEH, 2023b). Increased production of certain air pollutants and aero-allergens such as spores and moulds worsen asthma disease and increases the risk for lung infection in immune-compromised individuals (WHO, 2023b). Respiratory impacts of climate change due to poor air quality include asthma, respiratory allergies, and airway diseases. The most at-risk groups to the negative air quality impacts are children, older adults, persons with asthma, and immune-compromised persons are most vulnerable (NIH/NIEH, 2023b). Wildfire smoke can travel long distances, potentially exposing people both near and far from the fire location to a mixture of respiratory irritants. Wildfire burns vegetation (trees) and emits smoke that can harm lung and heart health. As wildfire moves into residential areas, they burn homes

and buildings, releasing toxic chemicals into the environment (NIH/NIEH, 2023e).

3.0 MITIGATION STRATEGIES FOR CLIMATE CHANGE IMPACT ON HEALTH

Mitigation strategies should aim at actions and policies that permanently reduce the production of greenhouse gases from industrial and agricultural sectors. These actions and policies will also target best practices aimed at reducing human activities that aggravate the production of these GHGs. It becomes very imperative to protect the food and freshwater ecosystems and resources within the changing climate. Policies should also focus on improving the food system to reduce food losses and waste. Options need to be explored throughout the food system to ensure climate resilience. For example, in food storage and transport, market transparency, siting of food processing facilities and other infrastructure (Fear, 2020). Improving breeding, genetics and nutrition is also very important. This practice has produced efficient results in the USA. For example, the use of cattle has drastically reduced in the USA. Consumption has reduced from 140 million head of cattle to 90 million head and those 90 million cattle are producing more meat (Quinton, 2019). Promoting sustainable climate-focused agricultural practices, such as crop rotation and drip irrigation, can help safeguard food safety. Adapting crop management, crop diversification, and food storage, supply, and distribution infrastructure to promote food safety can reduce contamination of food by pathogens and toxins thus resulting in improved food security.

Modification of built environments such as low impact landscaping and tree cover in urban settings can help mitigate air pollution and protect human health and safeguard communities from the health effects of climate change. Transportation alternatives such as reducing the number of vehicular miles travelled while increasing carpooling, use of public transportation, and other alternative transportation options can lower the level of emissions to ozone, particulate matter, and other pollutants associated with respiratory and cardiovascular diseases. Reduced burning of coal or other fossil fuels for energy production can lower exposure to heavy metals, such as mercury and lead, and nitrogen oxides and sulfur oxides (NIH/NIEH, 2023b). To mitigate vector-borne disease outbreaks, stabilising ecosystems through greenhouse gas reduction, forest and wetland preservation to limit climate variability and contain vector habitats is important. Also, improving surveillance systems and implementing early warning systems can reduce exposure to vectors and reduce the susceptibility of vector-borne diseases in exposed populations (NIH/NIEH, 2023d). Efforts should be channeled towards reducing the use of fossil fuels and increasing the use of renewable energy, electric vehicles or bikes will reduce air pollution. Many industrialised nations, especially those among the highest in production and emission of GHGs, have started generating more electricity using nuclear, renewable energy sources, and natural gases and budgeting good sums of money towards electric vehicles and use of cleaner-burning fuels. Nigeria has a national climate change policy spanning from 2021-2030 which is a comprehensive framework that aims at mitigation of climate change. Table 5 shows the summary of public health adaptation measures in relation to the health impacts of climate change (applicable to European populations). Transfer of technology is possible and encouraged in other regions of the world.

Table 5: Summary of public health adaptation measures in relation to the health impacts of climate change (applicable to European populations)

Health outcome	Public health	Surveillance
Mortality and morbidity due to heat waves	- Public health education -Health warming systems -Emergency preparedness	Enhance health surveillance of routine data for early detection of heat wave effects (e.g. monitoring from funeral homes, calls to NHS direct)
Floods	- Public health education - Boil water notices - Emergency preparedness -Checklist for post flood activities	Surveillance for flood effects, with long-term follow-up. Coordinated national surveillance for flood deaths, injuries and illnesses
Air quality	-Warnings for high pollution days	Daily air pollution measurements.
Vector-borne diseases	-Public health education especially to avoid contact with ticks	Monitoring of vectors, and reservoir hosts, integrated surveillance for human and animal diseases
Food-borne diseases	-Maintenance and strengthening of food hygiene measures	-Integrated surveillance for human and animal hygiene measures
Water-borne diseases	-Risk assessment for extreme rainfall events Risk assessment for health effects of algal blooms	-Increased microbiological monitoring of public water supplies and private wells, and blooms enhanced surveillance during and following heavy rain events

Source: Hainesa et al. 2006

4.0 CONCLUSION

The health impacts of climate change are vast, both visible and hidden. Global mitigation efforts must aim at limiting atmospheric temperature rise to 1.5°C. Government of nations should take this call seriously. Globally, efforts are being made, but it seems that those efforts are not yet good enough. Even though these extreme weather conditions have been happening in the past, climate change might have exacerbated their intensity and occurrence. If the current climate change and warming trends are not controlled, there will be an increase in global morbidity and mortality rates associated with cardiovascular diseases, malnutrition, injury, mental and psychological trauma, suicide, food-borne, water-borne, air-borne and vector-borne illnesses. More research is essential to assess and further understand the impacts of climate change and its associated diseases on human health. Due to the intricacies of climate and non-climate factors that affect diseases especially the communicable diseases, additional research is needed to better understand the mechanisms of how these factors interact and influence climate change related diseases. There is need for increased education and awareness campaigns on the negative health impacts of climate change.

REFERENCES

Ajilogba C. F. and Walker S. (2021). African Handbook of Climate Change Adaptation. W. Leal Filho et al. (eds.). http://doi.org/10.1007/978-3-030-45106-6_142.

Brida A. B., Owiyo T., and SokonaY. (2013). Loss and damage from the double blow of flood and drought in Mozambique. International Journal of Global Warming 5(4):514–531.

Blokhin A. (2024). The 5 Countries That Produce the Most Carbon Dioxide (CO2). Editors: Smith A. and Perez Y. https://www.investopedia.com/articles/investing/092915/5-countries-produce-most-carbon-dioxide-co2.asp. Accessed 18/08/24

Climate Change (2021): The Physical Science Basis, the Working Group I contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (eds. Masson-Delmotte, V. et al.). Cambridge University Press; 2021.

Climate Change, (2022). Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (eds H.-O. Pörtner, D.C. Roberts, et al.). Cambridge University Press; 2022.

European Parliament, (2023). Climate change: greenhouse gases causing global warming. https://www.europarl.europa.eu/topics/en/article/20230316STO77629/climate change-the-greenhouse-gases-causing-global-warming. Accessed 8/08/24

Fears, R. (2020). Climate change and its impact on food and nutrition security. Policy Department for Economic,

Scientific and Quality of Life Policies Directorate-General for Internal Policies. European Parliament. Briefing requested by the ENVI committee.

Food and Agriculture Organization (FAO) (2015). Climate Change and Food Security: Risks and Responses. Food and Agriculture Organization of the United Nations, Rome. Pp 1-98

Intergovernmental Panel on Climate Change (IPCC), (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. (Pörtner HO, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A, Craig M, Langsdorf S, Löschke S, Möller V, Okem A, Rama B, eds.). Cambridge University Press.

IPCC (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp.

Jones, P., and Smith, D. (2024). The role of healthcare professionals in addressing climate change: Challenges and opportunities for action. British Medical Journal, 40(6), 421-435.

Galal S. (2024). Percent of global CO2 emissions with origin in Africa 2000-2021. https://www.statista.com/statistics/1287508/africa-share-in-global-co2. Accessed 20/07/2024.

Global Carbon Atlas, (2024). Carbon Story: Visualizing human impact. https://globalcarbonatlas.org/emissions/carbon-story/. Accessed 18/08/2024

Hainesa, A., Kovatsa, R.S., Campbell-Lendrumb, D. and Corvalanb C. (2006). Climate change and human health: Impacts, vulnerability and public health. Journal of the Royal Institute of Public Health 120:585–596

Nicholls, N., Butler, C.D. and Hanigan, I. (2006). Inter-annual rainfall variations and suicide in New South Wales, Australia, 1964-2001. International Journal of Biometeorology, 50(3), 139-143.

NIH/NIEH, (2022). Human Health Impacts of Climate Change
https://www.niehs.nih.gov/research/programs/climatechange/health_impacts. Accessed 11/07/24

NIH/NIEH, (2023a). Climate Change and Human Health.
https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/foodborne_diseases. Accessed 11/07/24

NIH/NIEH, (2023b). Health Impacts of Air Quality
https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/asthma. Accessed 11/07/24

NIH/NIEHS, (2023c). Water-related Illnesses
https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/waterborne_diseases. Accessed 11/07/24

NIH/NIEH, (2023d). Vector-borne Diseases
https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/vectorborne. Accessed 11/07/24

NIH/NIEH, (2023e). Health Impacts of Extreme Weather
https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/weather_related_morbidity. Accessed 11/07/24

NIH/NIEH, (2023f). Climate Change and Human Health. https://www.niehs.nih.gov. Accessed 14/07/24

Statista, (2024a). Methane emissions in Sub-Saharan Africa from 2000 to 2019 (in million metric tons of CO_2 equivalent). https://www.statista.com/statistics/1312399/methane-emissions-in-sub-saharan-africa/. Accessed 20/07/2024.

Statista, (2024b). Distribution of reported economic losses due to natural disasters in Africa between 1970 and 2019, by type. https://www.statista.com/statistics/1270952/reported-economic-losses-due-to-natural-disasters-in-africa/. Accessed 20/07/2024.

Statista, (2024c). Largest natural disasters in Africa between 1970 and 2019, by number of deaths. https://www.statista.com/statistics/1271188/biggest-climate-disasters-in-africa-by-human-loss/ Accessed 20/07/2024

Macrotrends, (2022). Nigeria Hunger Statistics. https://www.macrotrends.net/countries/NGA/nigeria/hunger-statistics. Accessed 20/8/22

Noble, I.R., S. Huq, Y.A. Anokhin, J. Carmin, D. Goudou, F.P. Lansigan, B. Osman-Elasha, and A. Villamizar, (2014). Adaptation needs and options. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 833-868.

Okoli J. N. and Ifeakor, A. C. (2014). An Overview of Climate Change and Food Security: Adaptation Strategies and

Mitigation Measures in Nigeria. Journal of Education and Practice, Vol.5 (32):13-20.

Tiseo, I. (2023a). Annual methane emissions worldwide 1970-2022. https://www.statista.com/statistics/1298441/annual-global-methane-emissions/. Accessed 17/8/2024

Tiseo, I. (2023b). Share of global greenhouse gas emissions 2022, by gas. https://www.statista.com/statistics/1345801/share-of-global-greenhouse-gas-emissions-by-gas-type/. Accessed 17/8/2023

Tiseo, I. (.2024). Global atmospheric carbon dioxide concentration 1959-2023. https://www.statista.com/statistics/1091926/atmospheric-concentration-of-co2-historic/. Accessed 17/8/2023

Uchendu F. N. (2018). Hunger influenced life expectancy in war-torn Sub-Saharan African countries. Journal of Health, Population and Nutrition (2018) 37:11. https://doi.org/10.1186/s41043-018-0143-3.

Uchendu, F.N. (2022). Global Climate Change and Human Nutrition: Challenges and Mitigation. A Lecture presented at the Global Health Security Module Schedule for the participants of Executive Intelligence Management Course (EIMC), 15 2022 at National Institute for Security Studies (NISS), Abuja on Wednesday, 24th August, 2022.

United Nations, (2022). Climate Actions. https://www.un.org/en/climatechange/what-is-climate change#. 14/7/22

U.S. Environmental Protection Agency, (2021). Climate Change Indicators: U.S. Greenhouse A .Gas Emissions. https://www.epa.gov/climate-indicators/climate change-indicators-us-greenhouse-gas-emissions. 24/7/2024

United States Environmental Protection Agency, (2024). Overview of Greenhouse Gases. https://www.epa.gov/ghgemissions/overview-greenhouse-gases. Accessed 18/08/24

World Bank, (2024). Health and Climate Change. https://www.worldbank.org/en/topic/health/brief/health-and-climate change. Accessed 15/07/24

World Economic Forum (WEF), (2024). Quantifying the Impact of Climate Change on Human Health. Insight Report, January 2024. In collaboration with Oliver Wyman. Pp 1-48

WHO, (2003). Climate Change and Human Health: Risks and Responses / Editors: McMichael A. J., Campbell-Lendrum D.H., C.F. Corvalán C. F., Ebi K. L., Githeko A. K., Scheraga J.D., A. Woodward A.

WHO, (2023a). Climate change. https://www.who.int/news-room/fact-sheets/detail/climate change-and-health. Accessed 15/07/24

WHO, (2023b). Climate change and health. Report by the Director-General. Executive Board, 154th session, Provisional Agenda Item 22.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

NIGERIAN CORPORATE LAW IN MOTION: REGULATING ADOPTION OF AI IN BUSINESS OPERATIONS

***[1]Roland Akindele & [2]Naomi Boluwatife Ndidiaha**
[1]Faculty of Law, University of the Western Cape, Republic of South Africa
[2]Nigerian Law School, Lagos Campus, Nigeria
*Corresponding Author Email address: rollymack@gmail.com

ABSTRACT
Technological advancements continue to reshape business operations worldwide, posing new regulatory challenges. Consequently, Nigerian corporate law needs to address the regulation of Artificial Intelligence (AI) deployment in business activities. AI-powered tools are available for integration into various business operations, allowing companies to incorporate them into their corporate systems through their directors. This paper examines the evolving dynamics of Nigerian corporate law in response to integration of AI technology within corporate businesses. By analysing existing legal frameworks, the study assesses the feasibility, implications, challenges, and ethical considerations of regulating a company's decision to utilise AI. Through a comprehensive review of relevant literature, the paper contributes to the crucial conversation on the intersection of AI technology and corporate law in Nigeria, highlighting regulatory pathways to guide the transformative impact of AI on corporate operations. The paper offers recommendations for the optimal utilisation of AI technology by companies, aiming to benefit all stakeholders.

Keywords: *Artificial Intelligence, Corporate governance, Corporate law, Ethical Considerations, Technological advancements*

1.0 INTRODUCTION

In the rapidly evolving landscape of corporate governance, the integration of Artificial Intelligence (AI) technology poses both opportunities and challenges for regulatory frameworks worldwide (Taeihagh, 2021). As directors of companies increasingly explore the potential of AI to streamline operations, enhance decision-making processes, and drive innovation (Kaggwa et al, 2024), questions emerge regarding the regulatory oversight of such endeavours. How can the directors of a company put in place control measures when the need to incorporate AI technology into corporate operations becomes imperative? This question lies at the heart of ongoing discourse within legal circles, as stakeholders grapple with the implications of AI adoption on corporate governance practices, shareholder rights, and regulatory compliance (Han, 2022). Against this backdrop, this paper seeks to explore the interplay between Nigerian corporate law and AI technology, examining the regulatory mechanisms, ethical considerations, and practical challenges inherent in adopting the use of AI by corporate entities. This paper provides insights into the evolving dynamics of Nigerian corporate law in motion in addressing the transformative impact of AI on corporate business processes.

2.0 METHODOLOGY

This study investigates the evolving dynamics of Nigerian corporate law in response to the integration of AI technology within corporate businesses. To undertake this insightful exploration, a qualitative approach was selected to ensure a concentrated and thorough examination. Analytical deduction serves as the foundation for data collection and analysis, revealing significant insights. Using a desk-research methodology, the study examines a variety of literature sources. This research fills gaps in the current literature by systematically reviewing existing legal regulations in corporate administration vis-à-vis adoption of AI technology in business operations.

EXISTING LEGAL FRAMEWORK ON RESPONSIBILITIES OF DIRECTORS OF COMPANIES

In Nigeria, the legal framework governing the responsibilities of directors of companies primarily consists of the Companies and Allied Matters Act, 2020 (CAMA) and other related regulations (Onivehu & Nkum, 2022). Companies and Allied Matters Act, 2020 provides the foundational rules and principles guiding corporate governance and directorial responsibilities (Abraham, 2023). Specifically, Sections 279 to 303 of

CAMA outline the duties, powers, and liabilities of directors. These duties typically include acting in good faith, exercising reasonable care, skill, and diligence, and acting in the best interests of the company.

Furthermore, Nigerian corporate law also incorporates common law principles and judicial decisions that interpret and supplement the provisions of CAMA (Etuwewe, 2022). Courts often rely on these principles to adjudicate disputes involving directorial decisions, ensuring that directors adhere to their fiduciary duties and act in the best interests of the company and its stakeholders. Additionally, regulatory bodies such as the Corporate Affairs Commission (CAC) play a role in overseeing compliance with corporate governance standards and may issue guidelines or directives that impact directorial decision-making (Amuda & Al-Shattarat, (2021). These regulations aim to promote transparency, accountability, and fairness in corporate activities, including the adoption and use of new technologies such as AI.

ANALYSIS OF FIDUCIARY DUTIES OF DIRECTORS VIS-À-VIS ADOPTION OF AI TECHNOLOGY

In Nigerian corporate law, directors have fiduciary duties to their companies, which are critical to ensuring ethical and effective governance (Ajai, 2018). These fiduciary duties include the duties of loyalty, care, and disclosure. Let us break down these duties and see how they might apply to decisions regarding the adoption of AI technology by a company. CAMA governs corporate governance in Nigeria and outlines directors' duties. Section 305 of CAMA explicitly states that directors must act in the best interest of the company, emphasising the importance of loyalty, care, and disclosure (Ajai, 2018).

Duty of Loyalty

The duty of loyalty requires directors to act in the best interests of the company and avoid conflict of interests (Ajai, 2018). Directors must not use their position for personal gain at the expense of the company. This implies that, when deciding on AI adoption, directors must ensure that they do not have personal interests (Zhao & Gómez, 2023) in the AI technology provider that could influence their decision. It is important that directors should evaluate whether AI technology will benefit the company in the long term, considering factors such as cost savings, efficiency gains, and competitive advantage (Hickman & Petrinm 2021).

Duty of Care

The duty of care requires directors to make decisions with the diligence, care, and skill that a reasonably prudent person would use in similar circumstances (Davies & Cooper, 2023). Directors must be adequately informed before making decisions. In other words, directors need to thoroughly research and understand the AI technology, including its benefits, risks, and potential impact on the company (Reim, Åström & Eriksson, 2020). This might involve consulting experts, reviewing case studies, and analysing market trends. Also, directors acting on their duty of care ought to consider potential risks associated with AI (Li J., Li M, Wang & Thatcher, (2021), such as data privacy issues, cybersecurity threats, and the ethical implications of AI decisions, ensuring appropriate safeguards are in place.

Duty of Disclosure

The duty of disclosure requires directors to provide complete and accurate information to shareholders and other stakeholders (Vitolla, Raimo, Marrone & Rubino, 2020). This includes disclosing any material information that could affect the company's performance or stock price. It is ideal that directors disclose their plans for AI adoption to shareholders, detailing the expected benefits, costs, and risks (Lu, 2020). This transparency helps maintain trust and allows shareholders to make informed decisions. But it does not end there, after implementing AI, directors are expected to continue to report on its performance and any significant developments, (Wamba-Taguimdje, Wamba, Kamdjoug & Wanko, 2020) ensuring that stakeholders are kept informed about the impact of AI on the company's operations.

REGULATORY CHALLENGES AND LIMITATIONS IN THE USE OF AI TECHNOLOGY

In Nigeria, like in many other jurisdictions, the use of AI technology by corporate entities presents both opportunities and challenges. While AI can enhance decision-making, improve efficiency, and drive innovation, its adoption also raises regulatory considerations and limitations. Some of the key regulatory challenges and limitations faced by companies in Nigeria regarding the use of AI technology are:

Data Protection and Privacy Laws: The Nigerian Data Protection Regulation, 2019 (which has been replaced by the Nigerian Data Protection Act, 2023) governs the collection, processing, and storage of personal data (Babalola, 2022). Companies utilising AI technology must ensure compliance with these regulations to protect

the privacy rights of individuals and avoid potential legal liabilities related to data breaches or misuse of personal information. Section 29 of the Act requires entities to implement technical and organisational measures to protect personal information. Both the AI developer and entities or persons using AI to process personal data must ensure that they comply with the NDPA and other applicable laws in developing and using AI.

Ethical and Bias Concerns: AI systems can inadvertently perpetuate biases present in the data used to train them, leading to discriminatory outcomes (Schwartz et al, 2022). Therefore, while adopting AI technology, company directors need to address ethical considerations and ensure fairness, transparency, and accountability in the design, implementation, and use of AI algorithms to mitigate the risk of bias.

Intellectual Property Rights: AI technology often involves the creation and utilisation of intellectual property assets such as algorithms, software, and datasets (Aristodemou & Tietze, 2018). Due to this fact, companies must make conscious efforts to protect their proprietary AI innovations, including patents, copyrights, and trade secrets, while also respecting the intellectual property rights of others.

Cybersecurity Risks: The use of AI technology introduces cybersecurity risks, including vulnerabilities to hacking, malware, and unauthorised access to sensitive information (Jimmy, 2021). In deploying AI technology, companies need to implement strong cybersecurity measures and protocols to safeguard AI systems and data assets from cyber threats and breaches.

Regulatory Compliance and Oversight: Companies must comply with relevant regulatory frameworks governing specific industries or sectors where AI technology is employed (Cath, 2018), such as financial services, healthcare, or transportation. Regulatory compliance obligations may include licensing requirements, consumer protection standards, and industry-specific regulations that impact the use of AI in corporate operations.

Labour and Employment Laws: The adoption of AI technology may have implications for the workforce, including potential job displacement, changes in employment practices, and workforce retraining needs (Clifton, Glasmeier & Gray, 2020). Company directors should consider the impact of AI on labour and employment laws, including regulations related to employees' rights, workplace safety, and fair treatment of workers affected by automation.

Cross-Border Data Transfers: If AI systems involve the processing or transfer of data across international borders, directors must comply with data transfer regulations and international data protection standards to ensure lawful and secure cross-border data flows (Kong, 2010).

Regulatory Uncertainty: The regulatory environment for AI technology is still evolving in Nigeria, with emerging policy developments and regulatory initiatives (Oriji et al, 2023). Directors need to stay abreast of regulatory changes, engage with policymakers and industry stakeholders, and adopt a proactive approach to compliance with evolving regulatory requirements.

ETHICAL CONSIDERATIONS SURROUNDING THE USE OF AI TECHNOLOGY BY NIGERIAN COMPANIES

The use of AI technology by Nigerian companies raises several ethical considerations that must be carefully addressed to ensure responsible and ethical deployment of AI systems. We will discuss some key ethical considerations as follows:

Fairness and Equity: It is the duty of directors to ensure that AI systems do not perpetuate biases or discriminate against individuals or groups based on factors such as race, gender, ethnicity, or socioeconomic status (Schwartz, (2022). They should strive to promote fairness and equity in AI algorithms and decision-making processes to mitigate the risk of unintended bias and discrimination.

Transparency and Accountability: Directors should prioritise transparency in the use of AI technology, including disclosing how AI systems are deployed, what data is used, and how decisions are made. Transparent AI systems enable stakeholders to understand and scrutinize the decision-making process, fostering accountability and trust (Sasikala & Sachan, (2024).

Responsible Innovation and Risk Management: Companies are expected to adopt a responsible approach to AI innovation, considering the potential risks and ethical implications of AI applications throughout the development lifecycle (Díaz-Rodríguez et al, (2023). They should conduct thorough risk assessments, anticipate potential harms, and implement risk mitigation strategies to minimise adverse impacts on stakeholders.

Human-Centric Designs and Human Rights: Company directors are required to prioritise human-centric design principles in the development and deployment of AI systems, ensuring that technology serves human needs and respects fundamental human rights (Ulgen, 2021). They should uphold principles of dignity, autonomy, and non-discrimination in AI applications to safeguard human rights.

3.0 CONCLUSION

AI technology integration offers a number of potential and difficult obstacles for corporate business operations. The relationship between Nigerian corporate law and artificial intelligence has been examined in this paper, with a focus on the necessity of strong regulatory frameworks for ethical and efficient governance. Especially in the context of AI adoption, directors, who act as the human representatives of their companies, must carefully manage their fiduciary duties of loyalty, care, and disclosure. The study addresses the ethical issues of fairness, transparency, and human-centered design in addition to highlighting the regulatory challenges of data protection, intellectual property, cybersecurity, and compliance.

As AI continues to transform business operations, the evolving dynamics of Nigerian corporate law must adapt to safeguard the interests of all stakeholders, promoting responsible and beneficial utilisation of AI technology. This paper contributes to the critical discourse on AI and corporate governance, offering insights and recommendations for regulatory pathways that can steer the transformative impact of AI on corporate business processes. The regulation of adoption of AI technology by Nigerian companies is expected to evolve in response to emerging technological trends vis-à-vis legal and ethical considerations. Company directors, policymakers, legal experts, and stakeholders will need to collaborate to develop an effective regulatory framework that fosters innovation while ensuring responsible and ethical use of AI technology in corporate business operations. Companies through their directors must ensure that adequate control measures are put in place to mitigate legal and ethical risks associated with the use of AI technology in their business activities.

RECOMMENDATIONS

Due to the fact that AI technology continues to advance and become more pervasive in Nigerian corporate operations, there are several potential future developments and trends in Nigerian corporate law regarding the regulation of AI technology by companies. To this end, here are some recommendations:

Specific AI Regulations: The Nigerian National Assembly should urgently enact a law introducing specific regulations or guidelines for the responsible use of AI technology, particularly within corporate business activities (Reis, 2024). These regulations must rigorously address transparency, accountability, fairness, and ethical considerations in the deployment of AI systems by directors. Without clear legal standards, the risk of misuse and unethical practices remains high.

Amendment of CAMA to Include Ethical Standards: Rather than drafting entirely new laws, the Companies and Allied Matters Act (CAMA) should be amended to incorporate comprehensive ethical standards and guidelines for AI technology use by companies. This amendment should mandate principles of fairness, transparency, accountability, and respect for human rights in AI-driven decision-making processes, ensuring alignment with international best practices and ethical frameworks.

Enhanced Risk Management and Liability Frameworks: As AI systems become more autonomous and complex, Nigerian corporate law must evolve to provide clear legislative guidance on liability and risk management for directors overseeing AI adoption. Self-regulation by companies has proven insufficient; thus, legislative intervention is necessary to delineate responsibilities between humans and machines, establish strong accountability mechanisms, and define standards of care for AI-driven decisions.

Mandatory Training and Education for Directors: There is a need for the introduction of mandatory training and education requirements for company directors to ensure they fully understand AI technology, its implications for corporate governance, and their responsibilities in overseeing AI-driven operations (Nasila, 2024). This should include AI literacy and ethics training as part of director education programmes and ongoing professional development.

Sector-Specific AI Regulations: We recommend the development and implementation of sector-specific regulations or guidelines to address the unique challenges and opportunities presented by AI in different industries. For example, financial services regulators should establish guidelines for AI-driven risk management and compliance, while healthcare regulators should issue standards for AI-driven medical decision support systems. This targeted approach will ensure that the peculiarities of each sector are adequately addressed.

International Harmonisation of AI Regulations: Nigerian corporate regulations must align with international standards and initiatives for regulating AI technology, such as the Organisation of Economic Cooperation and Development (OECD) Principles on AI (Russo & Oder,

2023), the European Union (EU)'s AI Act, 2024, and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Recommendation on the Ethics of Artificial Intelligence, 2021. This alignment will facilitate international cooperation, promote interoperability, and enhance Nigeria's competitiveness in the global AI landscape.

By critically addressing these recommendations, Nigeria can establish a strong regulatory framework that ensures AI technology's ethical, transparent, and accountable deployment in corporate operations, thereby safeguarding stakeholder interests and promoting sustainable innovation.

REFERENCES

Abdulmalik, S. O. & Ahmad, A. C. (2020). Corporate governance and financial regulatory framework in Nigeria: Issues and challenges. *Journal of Advanced Research in Business and Management Studies*, *2*(1), 50-63.

Abraham, C.C. (2023) Duties and Responsibilities of Directors of a Company; CAMA 2020 (August 31, 2023) Retrieved from https://ssrn.com/abstract=4558024 or http://dx.doi.org/10.2139/ssrn.4558024

Ajai, O. (2018). Developing a corporate director's internal fiduciary duty to promote corporate sustainability: a comparative survey of hard and soft laws benchmarking

Akintola, S. O., & Akinpelu, D. A. (2021). The Nigerian Data Protection Regulation 2019 and data protection in biobank research. *International Data Privacy Law*, *11*(3), 307-318.

Amuda, Y. J., & Al-Shattarat, B. (2021). Fostering of efficiency and generality of cooperate governance frameworks in Nigeria and Jordan. *Academy of Strategic Management Journal*, *20*(6), 1-14.

Aristodemou, L., & Tietze, F. (2018). The state-of-the-art on Intellectual Property Analytics (IPA): A literature review on artificial intelligence, machine learning and deep learning methods for analysing intellectual property (IP) data. *World Patent Information*, *55*, 37-51.

Babalola, O. (2022). Nigeria's data protection legal and institutional model: an overview. *International Data Privacy Law*, *12*(1), 44-52.

Black, J., & Murray, A. D. (2019). Regulating AI and machine learning: setting the regulatory agenda. *European journal of law and technology*, *10*(3).

Cath, C. (2018). Governing artificial intelligence: ethical, legal and technical opportunities and challenges. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *376*(2133), 20180080.

Clifton, J., Glasmeier, A., & Gray, M. (2020). When machines think for us: the consequences for work and place. *Cambridge Journal of Regions, Economy and Society*, *13*(1), 3-23.

Davies, B., & Cooper, R. (2023). Directors' duties. In *Essential Business Law and Practice for SQE1* (pp. 39-46). Routledge.

Díaz-Rodríguez, N. et al (2023). Connecting the dots in trustworthy Artificial Intelligence: From AI principles, ethics, and key requirements to responsible AI systems and regulation. *Information Fusion*, 99, 101896. https://doi.org/10.1016/j.inffus.2023.101896

Etuwewe, O. A. (2022). Appraisal of the powers and roles of the Corporate Affairs Commission under the Companies And Allied Matters Act 2020. (An unpublished long essay). Retrieved from https://portal.bazeuniversity.edu.ng/student/assets/thesis/20230331142542829767901.pdf.

Hager, G. D. et al (2019). Artificial intelligence for social good. https://doi.org/10.48550/arXiv.1901.05406.

Han, H. (2022). *The impact of Artificial Intelligence (AI) and blockchain adoption in corporate governance: ethical perspectives* (Doctoral dissertation, Brunel University London).

Hickman, E., & Petrin, M. (2021). Trustworthy AI and corporate governance: the EU's ethics guidelines for trustworthy artificial intelligence from a company law perspective. *European Business Organization Law Review*, *22*, 593-625.

Jackson, H. E., & Rothstein, P. (2019). The Analysis of Benefits in Consumer Protection Regulations. *Harv. Bus. L. Rev.*, *9*, 197.

Jibrin, M. S., Ejura, S. B., & Augustine, N. I. (2014). The public procurement reforms in Nigeria: Implementation and compliance challenges. *Journal of Asian Business Strategy*, *4*(11), 149.

Jimmy, F. (2021). Emerging threats: The latest cybersecurity risks and the role of artificial intelligence in enhancing cybersecurity defenses. *Valley International Journal Digital Library*, 564-574.

Kaggwa, S. et al (2024). AI in decision making: transforming business strategies. *International Journal of Research and Scientific Innovation*, *10*(12), 423-444.

Kong, L. (2010). Data protection and transborder data flow in the European and global context. *European Journal of International Law*, *21*(2), 441-456.

Li, J., Li, M., Wang, X., & Thatcher, J. B. (2021). Strategic Directions for AI: The Role of CIOs and Boards of Directors. *MIS quarterly*, (3).

Lu, S. (2020). Algorithmic opacity, private accountability, and corporate social disclosure in the age of artificial intelligence. *Vand. J. Ent. & Tech. L.*, *23*, 99.

Nasila, M. (2024). *African Artificial Intelligence: Discovering Africa's AI Identity*. Jonathan Ball Publishers.

Nigerian Corporate Governance Code] Retrieved from https://www.securities-clinical-legal-dept.gov.ng/files/Legal-Framework-Documents/Nigerian-Corporate-Governance-Code.pdf

Nigerian law. *International Journal of Business Governance and Ethics*, *13*(2), 170-198.

Onivehu, J. B., & Nkum, K. J. (2022). An Appraisal of the Impact of Companies and Allied Matters Act 2020 on the Nigerian Business Community. *Journal of Commercial and Property Law*, *9*(1), 132-143.

Oriji, O. et al (2023). Financial technology evolution in Africa: a comprehensive review of legal frameworks and implications for ai-driven financial services. *International Journal of Management & Entrepreneurship Research*, *5*(12), 929-951.

Reim, W., Åström, J., & Eriksson, O. (2020). Implementation of artificial intelligence (AI): a roadmap for business model innovation. *Ai*, *1*(2), 11.

Reis, O. et al (2024). Privacy law challenges in the digital age: A global review of legislation and enforcement. *International Journal of Applied Research in Social Sciences*, *6*(1), 73-88.

Russo, L & Oder, N (2023) How countries are implementing the OECD principles in trustworthy AI. Retrieved from https://oecd.ai/en/wonk/national-policies-2

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

FACTORS RESPONSIBLE FOR EARLY PREGNANCY AMONG FEMALE TEENAGERS IN ESURE, AKURE SOUTH LOCAL GOVERNMENT AREA, ONDO STATE

Paul H. Ilegbusi[1,2,3] and Kayode Adenuga[3,4,5]

[1] *Community Health Department, Ondo State College of Health Technology, Akure, Nigeria.*
[2] *University of Law Business School. Birmingham Campus United Kingdom.*
[3] *Centre for Research Innovation Development and Entrepreneurship United Kingdom.*
[4] *Arden University, Birmingham Campus, United Kingdom.*
[5] *Institute for Artificial intelligence and Big Data (AIBIG), Universiti Malaysia Kelantan.*
Corresponding author's email address: princeilegbusi@gmail.com

ABSTRACT
Teenage pregnancy has recently gained popularity due to its numerous negative effects on the overall health of the adolescent nursing mother, the child, the family, and the entire community. The study investigated factors responsible for early pregnancy among female teenagers in Esure, Akure South Local Government, Ondo State, Nigeria. The study employed a descriptive design, administering 108 questionnaires for analysis using IBM SPSS Version 25. The findings revealed that 92.6% of the respondents are knowledgeable about teenage pregnancy; 86% have given birth; age at first sexual intercourse was highest between 17 – 19 years (44%); Primary causes of teenage pregnancy include a lack of sex education (70%), followed by peer pressure (35%), poverty (20%), and low self-esteem (19%). Other associated factors include a lack of self-control (28%), a lack of parenting (24%), and poverty (23%). The vulnerable groups include orphans (82.4%), children from single parents (74%), sexually active teenagers (92.6%), and gifts from the opposite sex (83.3%). The implications of teenage pregnancy include sexually transmitted infections (40%), abortion (23%), bleeding after birth (15%), death (14%), and infertility (8%). Other factors include school dropout (35.2%) and stigmatisation (34.3%). Prevention of teenage pregnancy includes health education (33.3%), abstinence (22.2%), use of contraceptives (18.5%), prevention of early marriage (9.3%), sex education (8.3%). The study recommends the introduction of youth-friendly health services, continuous health education, and the incorporation of human sexuality education into school curricula. The study also advocates for government support in establishing youth counselling centres and providing resources for pregnant and parenting teenagers.

Keywords: *Early pregnancy, Female teenagers, Pregnancy, Sex education, Teenage pregnancy*

1.0 INTRODUCTION

Teenage pregnancy poses a significant threat to public health in Nigeria, West Africa, and worldwide, with far-reaching consequences for both mothers and babies. Research has shown that adolescent pregnancy can lead to a range of complications, including anaemia, pre-eclampsia, preterm labour, and low birth weight (Etuk, 2020; Emmanuel, 2021; Lambonmung et al., 2022). The emotional response to pregnancy among teenagers is often mixed, with feelings of uncertainty, fear, and frustration, although some may also experience acceptance and a sense of responsibility (Peñafiel et al., 2019). Teenage mothers often face numerous challenges, including early marriage, family rejection, social isolation, and poor academic performance, which can lead to school dropout (Odiri & Anthonia, 2023). In southern Nigeria, the incidence of teenage pregnancy is a concern, with a reported rate of 1.95% and higher complication rates among mothers who do not receive proper prenatal care (Etuk, 2020). To combat this issue, experts recommend raising awareness, promoting effective contraceptive use, supporting girls' education, and providing quality obstetric care to reduce the prevalence and complications of teenage pregnancy (Etuk, 2020; Odiri & Anthonia, 2023).

A complex interplay of sociodemographic, familial, and cultural factors contributes to the high incidence of early pregnancy among female teenagers (Simwanza et al., 2022). Significant risk factors include limited access to formal education, inadequate understanding of contraception and sexual health, early marriage, and socioeconomic deprivation (Trichal, 2023; Sulaiman et al., 2023). Pregnancy-related complications such as anaemia, pre-eclampsia, and premature birth disproportionately affect teenage mothers (Etuk, 2020; Trichal, 2023). Furthermore, their babies face an increased risk of low birth weight and higher mortality

rates (Etuk, 2020). The absence of support from parents, educators, and healthcare professionals exacerbates the issue (Sulaiman et al., 2023). To effectively address this problem, targeted interventions should prioritise enhancing female education, delivering comprehensive sexual and reproductive health education, and improving access to contraception (Simwanza et al. 2022).

According to the World Health Organisation (2020), 39% of girls in the least developed countries marry before 18, and 12% before 15. The adolescent fertility rate varies significantly across regions. In 2018, Southeast Asia reported a rate of 33, ranging from 0.3 in North Korea to 83 in Bangladesh. Within countries, disparities also exist; for instance, in Ethiopia, fertility rates range from 1.8 in Addis Ababa to 7.2 in the Somalia region, with 3% of women aged 15-19 having begun childbearing in Addis Ababa compared to 23% in the Afar region (WHO, 2020).

Although the global adolescent fertility rate has declined, the actual number of births among adolescents remains high due to large and growing populations of young women in some regions. Eastern Asia and Western Africa report the highest numbers of births among teenagers, with 95,153 and 70,423 births, respectively (WHO, 2020). The 2018 Nigeria Demographic and Health Survey (NDHS) reveals that 19% of girls aged 15-19 in Nigeria have commenced childbearing, with 14% having given birth and 5% currently pregnant with their first child. The prevalence is significantly higher in northern regions, such as the Northwest, with 36%, compared to just 8% in the Southwest and South East. Cultural norms, socio-economic factors, and education levels influence this disparity. Teenage mothers face heightened health risks, including anaemia and pre-eclampsia, exacerbated by inadequate access to healthcare. Addressing this issue requires improving education, raising awareness about reproductive health, and enhancing access to contraception services (NPC & ICF, 2018; World Bank, 2019).

Martins et al. (2023) recommend a multifaceted approach to mitigate the incidence of early pregnancy among female teenagers, which includes comprehensive sex education in schools, enhanced access to family planning resources, and community-focused initiatives. Healthcare professionals are vital in preventing early pregnancy and providing support to adolescents who become pregnant (Martins et al., 2023). In Ondo State, Nigeria, female genital mutilation (FGM) is prevalent, with some believing it reduces promiscuity and enhances fertility (Taiwo, 2023). However, experts advocate for robust awareness campaigns and early education to eradicate this harmful practice (Taiwo, 2023). Research highlights the importance of innovative and engaging health education strategies in schools to effectively reach teenagers and provide them with essential knowledge about sexual health (Cherobini et al., 2022).

This study aims to investigate the factors responsible for early pregnancy among female teenagers in Esure Community, Akure South Local Government Area, Ondo State. Specifically, the study seeks to explore the perception of female teenagers on early pregnancy, identify the contributing factors, and propose strategies to minimise early pregnancy within the community. To achieve this, the study will address the following research questions: what is the perception of female teenagers on early pregnancy in Esure community? What are the factors responsible for early pregnancy among female teenagers in Esure community? And what are the strategies to minimising early pregnancy among female teenagers in Esure community?

2.0 METHODS

STUDY DESIGN

The research used a descriptive study design to investigate the factors responsible for early pregnancy among female teenagers in the Esure community, Akure South Local Government Area, Ondo State.

STUDY AREA

Akure is the capital of Ondo State in southwestern Nigeria. Akure is located approximately 7°25’ north of the equator and 5°19’ east of the Meridian. Esure, which is under Akure South Local Government Area of Ondo State, Nigeria, has a total population of 28,375 as of the 2006 population census. It is surrounded by communities like Sijuade, Kajola, and Ijomimo. People in Esure practice Christianity, Islam, and traditional religions.

The language they speak is Akure dialect. The majority of the people are civil servants, while others are traders, farmers, and artisans. Inhabitants of Esure are mainly Yoruba, Hausa, Igbo, and Fulani ethnic groups. There is one basic health centre that provides health care services for the people in that geographical area. There are six (6) private primary schools, three (3) private secondary schools, and one (1) government primary and secondary school. The available communication networks include MTN, GLO, AIRTEL, and ETISALAT, and their primary sources of water are wells and boreholes.

STUDY POPULATION

This study was carried out among teenagers between the ages of 13 and 19 in the Esure community.

SAMPLE SIZE DETERMINATION

One hundred and twenty (120) respondents were used for this research in the Esure community, Akure South Local Government, Ondo State.

SAMPLING TECHNIQUE

This research used a simple random sampling technique, which gives each respondent an equal chance of selection.

STUDY INSTRUMENT, DATA COLLECTION, AND ANALYSIS

For this research, we developed a structured questionnaire with two sections to gather relevant and effective data from the respondents in the study area. We then compiled, organised, and analysed the collected quantitative data.

ETHICAL CONSIDERATION

We sought informed consent from the head of the community and the respondents. We assured the respondents that their privacy would remain confidential.

3.0 RESULTS

One hundred and twenty questionnaires (120) were distributed to the respondents, but one hundred and eight (108) questionnaires were retrieved completely and analysed as follows:

TABLE 1: ***Demographics of Respondents***

Variable	Category	Frequency	Percentage (%)
Age of the respondents (in years)	18-20	18	16.7%
	21-23	36	33.3%
	24 and above	54	50%
	TOTAL	108	100%
Marital status of the respondents	Single	28	26%
	Married	62	57%
	Divorce	14	13%
	Widow	4	4%
	Total	108	100%
Respondents' occupation	Students	35	32%
	Farmer	17	16%
	Trader	25	23%
	Artisan	18	17%
	Civil servant	13	12%
	Total	108	100%
Respondents' educational status	Primary	12	11%
	Secondary	31	29%
	Tertiary	49	45%
	None	16	15%%
	Total	108	100%
Respondents' religion	Christianity	68	63%
	Islam	30	28%
	Traditional	10	9%
	Total	108	100%
Respondents' number of children	1 Child	29	27%
	2 Children	31	29%
	More than 2 Children	33	31%
	No child	15	14%
	Total	108	100%
Respondents' age of first intercourse	11-13 Years	27	25%
	14-16 Years	23	21%
	17-19 Years	47	44%
	None	11	10%
	Total	108	100%

Table 1 shows that 18 (16.7%) of the respondents are within the age range of 18-20 years, 36 (33.3%) fall within the age range of 21-23 years, and 54 (50%) fall within the age range of 24 years and above; 28 (26%) of the respondents are single, 62 (57%) of the respondents are married, 14 (13%) are divorced, and 4 (4%) are

widows; 35 (32%) of the respondents are students, 17 (16%) are farmers, 25 (23%) are traders, 18 (17%) are artisans, and 13 (12%) are civil servants; 12 (11%) of the respondents have primary school education, 31 (29%) are secondary school certificate holders, 49 (45%) have tertiary education, and 16 (15%) did not attend school at all; 68 (63%) of the respondents are Christians, 30 (28%) are Islam faithful, and 10 (9%) are traditionalists; 29 (27%) of the respondents have 1 child, 27 (29%) have 2 children, 33 (31%) have more than 2 children, while 15 (14%) have no child; 27 (25%) respondents had their first intercourse between 11-13 years, 23 (21%) between 14-16 years, and 47 (44%) between 17-19 years, while 11 (10%) have not had sex before.

TABLE 2: ***Respondents' Knowledge About Teenage Pregnancy***

Variable	Category	Frequency	Percentage (%)
Respondent's response on what teenage pregnancy is	Having children anytime	5	4.6%
	A young girl less than 19 years with pregnancy	100	92.6%
	Having the number of children you want	3	2.8%
	Total	108	100%
Do you think lack of sex education is the major cause of teenage pregnancy?	Yes	76	70%
	No	32	30%
	Total	108	100%
Do you agree that the earlier a girl starts having sexual intercourse, the better for her growth?	Yes	23	21%
	No	85	79%
	Total	108	100
Do you think not involving in early sexual intercourse makes a teenager not sociable?	Yes	23	21%
	No	85	79%
	Total	108	100
Do you agree that a girl who is not sexually active is not sociable?	Yes	22	20%
	No	86	80%
	Total	108	100
Do you agree that early sexual activity by a girl promotes her growth?	Yes	38	35%
	No	70	65%
	Total	108	100
Do female teenagers love it if one of their age group gets pregnant?	Yes	22	20%
	No	86	80%
	Total	108	100
Should teenage pregnancy be encouraged among adolescents?	Yes	22	20%
	No	86	80%
	Total	108	100

Table 2 reveals that 5 (4.6%) of the respondents agreed that teenage pregnancy refers to having children at any age, 100 (92.6%) agreed that teenage pregnancy refers to a young girl under the age of 19, and 3 (2.8%) agreed that teenage pregnancy refers to having the number of children one wants; 76 (70%) of the respondents think lack of sex education is the major cause of teenage pregnancy while 32 (30%) of the respondents does not think lack of sex education is the major cause of teenage pregnancy; 23 (21%) of the respondents agreed that the earlier a girl starts having sexual intercourse, the better for her growth, while 85 (79%) of the respondents do not agree that the earlier a girl starts having sexual intercourse, the better for her growth; 23 (21%) of the respondents think not involving in early sexual intercourse makes a teenager not sociable, while 85 (79%) of the respondents do not think not involving in early sexual intercourse makes a teenager not sociable; 2 (20%) of the respondents agree that a girl who is not sexually active is not sociable, while 86 (80%) of the respondents disagree; 38 (35%) of the respondents agree that early sexual activity by a girl promotes her growth while 70 (65%) of the respondents do not agree that early sexual activity by a girl promotes her growth; 22 (20%) of the respondents agreed that female teenagers love if one of their age groups gets pregnant, while 86 (80%) of the respondents do not agree that female teenagers love if one of their age groups gets pregnant; 22 (20%) of the

respondents agree that teenage pregnancy should be encouraged among adolescents, and 86 (80%) said teenage pregnancy should not be encouraged among adolescents.

TABLE 3: ***Factors responsible for Teenage Pregnancy***

Variable	Category	Frequency	Percentage (%)
Respondent's response on factors leading to teenage pregnancy	Peer pressure	38	35%
	Family breakdown	15	14%
	Low self -esteem	21	19%
	Poverty	22	20%
	Lack of sex education	7	7%
	Media	5	5%
	Total	108	100%
What is the associated factor responsible for teenage pregnancy?	Lack of parenting	26	24%
	Poverty	25	23%
	Lack of sex education	27	25%
	Lack of self-control	30	28%
	Total	108	100%
Are orphans vulnerable to teenage pregnancy?	Yes	89	82.4%
	No	19	17.6%
	Total	108	100
Are children from a single parent vulnerable to teenage pregnancy?	Yes	80	74%
	No	28	26%
	Total	108	100
Are sexually active teenagers vulnerable to teenage pregnancy?	Yes	100	92.6%
	No	8	7.4%
	Total	108	100
Can gifts received from men influence teenage pregnancy?	Yes	90	83.3%
	No	18	16.7%
	Total	108	100
Is culture contributing to teenage pregnancy?	Yes	84	78%
	No	24	22%
	Total	108	100

Table 3 shows that 38 (35%) of the respondents agreed that peer pressure is a factor leading to teenage pregnancy, 15 (14%) agreed family breakdown, 21 (19%) agreed low self-esteem, 22 (20%) agreed poverty, 7 (7%) agreed lack of sex education, and 5 (5%) agreed that media is a factor; 26 (24%) of the respondents agree that lack of parenting is the associated factor responsible for teenage pregnancy, 25 (23%) agree that poverty, 27 (25%) agree that lack of sex education, and 30 (28%) agree that lack of self-control; 89 (82.4%) of the respondents agree that orphans are vulnerable to teenage pregnancy, while 19 (17.6%) of the respondents disagree; 80 (74%) of the respondents agree that children from a single parent are vulnerable to teenage pregnancy, while 28 (26%) of the respondents disagree; 100 (92.6%) of the respondents agree that sexually active teenagers are vulnerable to teenage pregnancy while 8 (7.4%) of the respondents disagree; 90 (83.3%) of the respondents agree that gifts from men can influence teenage pregnancy, while 18 (16.7%) of the respondents disagree; 84 (78%) of the respondents agree that culture contributes to teenage pregnancy while 24 (22%) of the respondents do not agree that culture contributes to teenage pregnancy.

TABLE 4: ***Effects of Teenage Pregnancy***

Variable	Options	Frequency	Percentage (%)
Do you think it is possible for a pregnant teenager to perform better academically than her unpregnant peers in school?	Yes	27	25%
	No	81	75%
	Total	108	100
It is possible for a pregnant teenager to meet up with her peers in her academic performance after delivery?	Yes	32	29.6%
	No	76	70.4%
	Total	108	100
What are the implications of teenage pregnancy on adolescent's health?	Sexually transmitted infections	43	40%
	Abortion	25	23%
	Infertility	9	8%
	Death	15	14%
	Bleeding after birth	16	15%
	Total	108	100%
What are the implications of teenage pregnancy on adolescent education?	School dropout	38	35.2%
	Poor performance in school	33	30.5%
	Stigmatisation	37	34.3%
	Total	108	100%

Table 4 shows that 27 (25%) of the respondents agree that it is possible for a pregnant teenager to perform better academically than her unpregnant peers in the school while 81 (75%) do not agree; 32 (29.6%) of the respondents believe it is possible for a pregnant teenager to meet up with her peers in her academic performance after she has gone to deliver, while 76 (70.4%) of the respondents do not believe that it is possible; 43 (40%) of the respondents agree that sexually transmitted infections are the implications of teenage pregnancy on adolescent health. 25 (23%) of the respondents said abortion, 9 (18%) of the respondents said infertility, 15 (14%) of the respondents said death, and 16 (15%) of the respondents said bleeding after birth; 38 respondents, or 35.2%, cited school dropout as the impact of teenage pregnancy on adolescent education. 33 (30.5%) of the respondents cited poor school performance as the impact of teenage pregnancy on adolescent education, while 37 (34.3%) cited stigmatization.

TABLE 5: ***Prevention of Teenage Pregnancy***

Variable	Category	Frequency	Percentage (%)
How can teenage pregnancy be prevented?	Through health education	36	33.3%
	Through abstinence	24	22.2%
	Through the use of contraceptive	20	18.5%
	Through media campaign	9	8.3%
	Through prevention of early marriage	10	9.3%
	Through sex education	9	8.3%
	Total	108	100%

The shows that 36 (33.3%) of the respondents said teenage pregnancy can be prevented through health education, 24 (22.2%) of the respondents through abstinence, 20 (18.5%) of the respondents using contraceptives, 9 (8.3%) of the respondents through

media campaigns, 10 (9.3%) of the respondents through prevention of early marriage, and 9 (8.3%) of the respondents through sex education.

4.0 DISCUSSION

Teenage pregnancy presents a significant public health challenge in Nigeria, with serious consequences for both mothers and their children. The purpose of this study was to investigate the factors contributing to early pregnancy among female teenagers in Esure, Akure South Local Government Area, Ondo State, Nigeria.

This research revealed that most respondents experienced their first sexual encounter between the ages of 17 and 19, with smaller percentage having sexual intercourse between the ages of 11 and 16. These findings are consistent with the studies of Emmanuel (2021) and the World Health Organisation (WHO, 2020), which observed that adolescents typically initiate sexual activity between the ages of 15 and 19.

Regarding the respondents' understanding of teenage pregnancy, majority correctly identified it as pregnancy occurring in girls younger than 19, which aligns with Emmanuel (2021) definition. However, a small percentage of respondents held misconceptions, with few believing teenage pregnancy could occur at any age and few associating it with having multiple children.

The study also identified a lack of sex education as a primary cause of teenage pregnancy, with majority of the participants supporting this view, a finding that aligns with the research of Sulaiman et al. (2023). Additionally, some of the respondents held the misconception that early sexual activity benefits a girl's growth, while the majority disagreed with this notion.

Key factors contributing to teenage pregnancy identified in this study include peer pressure, family breakdown, low self-esteem, poverty, lack of sex education, and media influence. These factors are in agreement with findings from previous studies (Sulaiman et al., 2023; Simwanza et al., 2022), which highlighted similar social and economic pressures leading to early pregnancy.

In terms of preventive measures, some of the respondents recommended health education, the use of contraceptives, and some advocated for abstinence. These recommendations align with Martins et al. (2023), who emphasised the importance of comprehensive sex education and accessible contraceptive services in preventing teenage pregnancy.

The study also found that majority of the respondents believed orphans are particularly vulnerable to teenage pregnancy, while more than half identified children from single-parent households as at risk. Furthermore, the majority of the respondents acknowledged that sexually active teenagers are more vulnerable to pregnancy.

Majority of the respondents acknowledged the impact of gifts from men on teenage pregnancy, corroborating Taiwo (2023) findings that transactional relationships frequently result in early pregnancies. Additionally, more than half of the respondents agreed that cultural practices contribute to teenage pregnancy, consistent with Emmanuel (2021) findings on the role of cultural norms in early pregnancy.

Finally, the study highlighted the significant academic and health implications of teenage pregnancy. The majority of respondents believed that pregnant teenagers perform worse academically than their peers, a concern that aligns with findings from the Nigeria Demographic and Health Survey (NPC & ICF, 2018). Researchers identified health risks like anaemia, pre-eclampsia, and sexually transmitted infections as significant concerns (Etuk, 2020; WHO, 2020).

5.0 CONCLUSION

This study underscores the significant public health issue posed by teenage pregnancy in Esure, Akure South Local Government Area, Ondo State, Nigeria. The research highlights the complex interplay of factors contributing to early pregnancy among female teenagers, including inadequate sex education, socioeconomic challenges, peer pressure, and cultural influences. The findings reveal that while a majority of teenagers are aware of the risks and implications of early pregnancy, misconceptions and gaps in knowledge persist, particularly concerning sexual health and the use of contraceptives.

To effectively address this issue, a multifaceted approach is required, one that combines comprehensive sex education, improved access to reproductive health services, and community support. By empowering young girls with the knowledge and resources they need to make informed decisions and by addressing the socio-economic and cultural factors that contribute to early pregnancy, it is possible to reduce the incidence of teenage pregnancy and its associated risks. The insights gained from this study can inform policy development and program implementation aimed at safeguarding the health and future of adolescent girls in Nigeria.

RECOMMENDATION

We propose the following recommendations based on the research findings:

Parental Involvement: Parents should actively provide for their children and serve as positive role models.

Promotion of Abstinence: Stressing the value of abstinence and techniques for postponing sexual activity is important.

Sexuality Education at Home: Parents should educate their children on sexual health and maintain a close, communicative relationship with them.
Creating a Safe Home Environment: Parents should ensure that the home environment is protective and shields children from harmful influences.
Family Planning Education: Healthcare providers should encourage sexually active youth to use modern family planning methods, with a strong emphasis on correct and consistent condom use.
Youth-Friendly Health Services: To make health services more accessible and welcoming to young people, the government should introduce them.
Continuous Health Education: Young people should receive ongoing health education at various forums, especially during school health programs.
Integration of Sexuality Education in Schools: The government should include comprehensive sexual education in the school curriculum.
Establishment of Youth Counselling Centres: The government should establish counselling centres in cities and local government areas, offering teenagers access to advice on various issues, including sexual health.
Contraceptives Provision: The government should ensure that contraceptives are readily available for sexually active teenagers.
Funding for Sexual Education and Support Services: The government should allocate reasonable funding for the promotion of comprehensive sexual education and the provision of support services to pregnant and parenting teenagers.

REFERENCES

Cherobini, E., Santonastaso, V., & Fabbri, C. (2022). Innovative health education strategies for teenagers: A case study in sexual health education. *Journal of Adolescent Health*, 70(4), 580-587. https://doi.org/10.1016/j.jadohealth.2021.11.021

Etuk, U. (2020). Maternal and child health in Nigeria: Addressing teenage pregnancy. *African Journal of Reproductive Health*, 24(2), 123-132. https://doi.org/10.29063/ajrh2020/v24i2.14

Lambonmung, A., Asare, J., & Ampofo, G. (2022). Complications associated with adolescent pregnancy in West Africa. *International Journal of Obstetrics and Gynecology*, 158(1), 54-62. https://doi.org/10.1002/ijgo.14275

Martins, L. P., Olufemi, T., & Adeyemi, A. (2023). Preventing early pregnancy through comprehensive sex education. *Nigerian Medical Journal*, 64(1), 45-51. https://doi.org/10.4103/nmj.nmj_17_23

National Population Commission [NPC] & ICF. (2018). Nigeria Demographic and Health Survey 2018. NPC and ICF.

Odiri, E., & Anthonia, A. (2023). Challenges and interventions for teenage mothers in Southern Nigeria. *Nigerian Journal of Educational Research and Development*, 19(1), 75-85.

Peñafiel, C., Sánchez, M., & Lara, M. (2019). Emotional responses to adolescent pregnancy in Latin America. *Journal of Family Issues*, 40(3), 456-472. https://doi.org/10.1177/0192513X18803388

Simwanza, R., Chanda, E., & Mwape, A. (2022). Sociodemographic factors influencing teenage pregnancy in Zambia. *African Population Studies*, 36(1), 45-56. https://doi.org/10.11564/36-1-1718

Sulaiman, A., Bello, M., & Yakubu, A. (2023). Socioeconomic determinants of adolescent pregnancy in Northern Nigeria. *Journal of Reproductive Health*, 17(2), 101-112. https://doi.org/10.1186/s12978-023-01503-8

Taiwo, F. (2023). Female genital mutilation and teenage pregnancy in Ondo State, Nigeria. *International Journal of African Studies*, 13(2), 214-226. https://doi.org/10.1080/13629387.2023.1790581

Trichal, M. (2023). Understanding early marriage and its impact on adolescent pregnancy. *Journal of Child and Adolescent Behavior*, 11(4), 89-98. https://doi.org/10.4172/2375-4494.1000587

World Bank. (2019). Adolescent fertility rate in Nigeria. *World Development Indicators*. https://data.worldbank.org/indicator/SP.ADO.TFRT

World Health Organization. (2020). Adolescent pregnancy: Fact sheet. https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

EFFECTS OF SEX EDUCATION AMONG PRIVATE SECONDARY SCHOOL GIRLS IN ILEKUN COMMUNITY, AKURE SOUTH LOCAL GOVERNMENT AREA, ONDO STATE, NIGERIA.

Paul Hassan Ilegbusi[1,2] & Michael Olabode Tomori[2,3,4]

[1] *Community Health Department, Ondo State College of Health Technology, Akure, Nigeria.*
[2] *Centre for Research Innovation Development and Entrepreneurship, United Kingdom.*
[3]*Department of Strategic Information/Science, APIN, Abuja.*
[4]*Department of Public Health, Texila American University, Guyana.*
Corresponding author's email address: princeilegbusi@gmail.com

ABSTRACT

Sexuality education is a central aspect of being human throughout life and encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction. This study was aimed at investigating the effects of sex education among private secondary school girls in Ilekun, Akure South Local Government Area, Ondo State, Nigeria. The study design was descriptive, using simple random technique and 120 structured questionnaires were administered and retrieved for analysis, using SPSS frequency table and simple percentage. The study revealed that 97.5% of the students have heard about sex education, comprising 39% (from home), 28% (from school), 11.6% (from religious houses), 5.8% (from internet), 4% (from friends), 3% (from radio/television), 2.5% (from social media), and 2.5% (from sexual books/magazines). Those introduced to sex education between 10 and 14 years old were 65.8%; 51.6% agreed that sex education is not taught in secondary schools because of the following reasons: shy to talk about it (82.5%), not included in school curriculum (82.5%), no trained sex education counselor (72.5%), and no enough time for it in school (76.6%). Effects of sex education include: reduction of unwanted pregnancy (90.8%), reduced sexually transmitted infections (93%), changes one's sexual attitude (91.6%), being responsible (87.5%), promotes abstinence (79%), and lacks of it leads to rape (94%). The study concludes that sex education should be integrated into the secondary school curriculum with well trained counselors. Additionally, it emphasizes the role of parents, religious institutions, communities and government in promoting sexuality education.

Keywords: *Education, Effects, Sex education, Sexuality*

1.0 INTRODUCTION

Sexuality plays a fundamental role throughout human life, encompassing elements such as sex, gender identity, gender roles, sexual orientation, eroticism, and intimacy (Vanwesenbeeck, 2020). It is shaped by a range of factors, including biological aspects (such as age and sex), societal influences (like culture and religion), and psychological elements (Cortinez et al., 2021). Studies on sexuality education for secondary school girls have identified notable gaps and challenges. For instance, in Nepal, only 19% of secondary students could differentiate between sex and gender, suggesting that the current sexuality education curriculum is inadequate (Rupashree Niraula, 2021). The COVID-19 pandemic has intensified negative sexual and reproductive health outcomes for girls in Kenya, with a rise in pregnancy rates and school dropouts (Zulaika et al., 2022). In Italy, sexuality education in schools is often limited to STI prevention, lacking a comprehensive approach (Chinelli et al., 2022). Conversely, mobile health education initiatives have shown potential in enhancing sexual health literacy among female secondary students in rural Thailand (Narkarat et al., 2021). These observations underscore the necessity for more thorough, systematic, and innovative methods in sexuality education for secondary school girls, addressing knowledge gaps and mitigating the effects of external challenges like pandemics.

In Nigeria, sex education and access to sexual and reproductive health services for adolescents encounter substantial barriers due to sociocultural norms and beliefs. Early sex education is essential for tackling issues such as teenage pregnancies and sexual abuse (Zaitawa, 2023). Nonetheless, societal stigmas and beliefs about adolescent sexuality often obstruct access to contraceptives for unmarried girls (Ogundiran et al., 2024). Cultural norms that emphasize chastity and family honour contribute to low contraceptive use and early marriages (Taiwo et al., 2023). Targeted interventions are necessary as mere knowledge is insufficient to reduce HIV risk behaviours (Chizoba et al., 2020). School-based programs that incorporate social cognitive theory could help bridge the gap between knowledge and behaviour (Chizoba et al., 2020). To enhance sexual and reproductive health outcomes for Nigerian adolescents, it is crucial to address detrimental social norms and promote normative change through collaborative efforts across sectors (Ogundiran et al., 2024; Taiwo et al., 2023).

Sex education significantly impacts sexual and reproductive health outcomes for adolescents both in Nigeria and globally. Research shows that early sex education can mitigate issues such as teenage pregnancies, abortions, and sexual misuse (Zaitawa, 2023). In Nigeria, interventions have improved knowledge, attitudes towards sexual and reproductive health, and the uptake of related services (Okooboh & Martins, 2023). However, inadequate sex education can result in misconceptions and risky behaviours among adolescents (Sejati & Mufida, 2021). The internet, while a source of information, may offer content that conflict with local cultural norms, potentially negatively affecting sexual education (Al-Turki, 2022). Despite some positive outcomes, methodological limitations in current studies affect the evaluation of intervention effectiveness, indicating a need for more robust research designs and extended follow-up periods (Okooboh & Martins, 2023).

In Nigeria, sex education is vital for addressing teenage pregnancies, abortions, and sexually transmitted infections (Zaitawa, 2023; Chizoba et al., 2020). However, challenges in implementing effective programs persist due to sociocultural beliefs and stigma, which often restrict access to contraceptives and sexual health information for unmarried adolescent girls (Ogundiran et al., 2024). Many teenagers turn to mass media and peers for sexual information rather than relying on family or school (Amir et al., 2022). To tackle these challenges, comprehensive school-based HIV prevention programmes using social cognitive theory principles are recommended (Chizoba et al., 2020). Additionally, revising and updating the Family Life and HIV Education programme in Nigerian secondary schools is essential (Chizoba et al., 2020). Changing societal views on adolescent sexuality and promoting the advantages of preventing unplanned pregnancies through multi-sectoral collaboration are crucial for improving sexual health outcomes among Nigerian youth (Ogundiran et al., 2024).

In Nigeria, 19% of women start engaging in sexual activity by the age of 15, and 57% by the age of 18 (National Population Commission & ICF, 2019). Adolescent childbearing often leads to negative social outcomes, particularly affecting educational success. Teen mothers are more likely to drop out of school, which can restrict their future job prospects and other opportunities (UNESCO, 2017). Among Nigerian women aged 15-19, 19% have begun childbearing; 14% have already given birth, and 4% are pregnant with their first child (National Population Commission & ICF, 2019). Bauchi State reports the highest rates of teenage pregnancy, ranging from 34% to 41%, whereas Ondo State has the lowest rates, between 1% and 9%. The incidence of teenage sexual activity is notably higher in the Northwest at 29%, compared to the Southwest. Globally, unsafe abortions number around 73 million annually (World Health Organization [WHO], 2020). Of all unintended teenage pregnancies, 60% end in induced abortions, and 45% of abortions are unsafe, with 97% occurring in developing regions such as West Africa and Nigeria. Adolescents who begin sexual activity early are at greater risk of contracting sexually transmitted infections (STIs) and HIV/AIDS compared to those who start later. Each year, 27% of female adolescents are diagnosed and treated for STIs, and 14% of confirmed HIV/AIDS cases are reported, often due to multiple sexual partners and insufficient knowledge about effective contraceptive use (National Population Commission & ICF, 2019).

This study aims to investigate the impact of sex education on secondary school girls in the Ilekun community, Akure South Local Government Area, Ondo State. The study seeks to achieve three main objectives: to assess the current level of knowledge about sexuality education among secondary school girls, to identify factors influencing sex education, and to examine the effects of sex education on the girls' sexual and reproductive health outcomes. To guide the study, three research questions will be explored: the current level of knowledge about sexuality education among the girls, the factors influencing the delivery and effectiveness of sex education, and the perceived and actual effects of the current sex education programs on the girls' sexual and reproductive health outcomes.

2.0 METHODS

Study Design

This cross-sectional study employed a descriptive design to evaluate the impact of sex education on the sexual behavior of secondary school girls in the Ilekun community, Akure South Local Government Area, Ondo State.

Study Area

The study was conducted in Ilekun Community, Akure South Local Government Area, Ondo State, which has a population of approximately 9,000 residents (2006 census). The community is situated near several neighbouring towns and lacks a local market, relying on nearby markets for commerce. Ilekun is religiously and ethnically diverse, with a mix of Christianity, Islam, traditional religions, and various ethnic groups, including Yorubas, Hausas, and Igbos. The community has limited educational facilities, including one government primary school, three private secondary schools, and a private health training institution. Healthcare options include a

basic health centre and private hospitals. The local economy encompasses various industrial and commercial activities, such as manufacturing, agriculture, and services, with some residents employed as civil servants. Infrastructure in Ilekun includes boreholes and deep wells for water supply, national grid electricity, and telecommunication networks (MTN, Airtel, and Glo).

Study Population
The study population consisted of all secondary school girls residing in the Ilekun community, Akure South Local Government Area, Ondo State.

Sample Size
The sample for this study included 120 secondary school girls selected from three private secondary schools within Ilekun. The sample comprised 20 junior students and 20 senior students from each school, aimed at assessing the effects of sex education on their sexual behaviour.

Sampling Technique
Simple random sampling was employed to ensure that each respondent had an equal chance of being selected, thereby minimizing selection bias.

Study Instrument, Data Collection, And Analysis
Data were collected using a structured questionnaire designed to address the research aims, objectives, and questions based on a review of relevant literature. The structured questionnaires were distributed to the respondents and subsequently collected for analysis.

Ethical Approval
Prior to data collection, official approval was secured from the principals of the participating private secondary schools, ensuring the study's alignment with institutional guidelines. Furthermore, informed consent was obtained from all respondents, who were guaranteed the confidentiality and anonymity of their responses, in accordance with ethical research standards.

3.0 RESULTS

One hundred and twenty (120) questionnaires were administered, retrieved, and analysed as follows:
Table 1 shows that: 2 respondents (1.6%) are within ages 8-10 years, 49 respondents (40.8%) are within ages 11-13 years, 49 respondents (40.8%) are within ages 14-16 years, and 20 respondents (16.6%) are within ages 17-19 years; 15 respondents (12.5%) are in J.S.S. One, 15 respondents (12.5%) are in J.S.S. Two, 15 respondents (12.5%) are in J.S.S. Three, 15 respondents (12.5%) are in S.S. One, 36 respondents (30%) are in S.S. Two while 24 respondents (20%) are in S.S. Three; 5 respondents (4%) are living with their Father only; 12 respondents (10%) are living with their Mother only; 93 respondents (77.5%) are living with both parents; 8 respondents (6.6%) are living with step-parents while 2 respondents (1.6%) are living alone; 105 respondents (87.5%) are Christian, 11 respondents (9%) practice Islamic religion while 4 respondents (3%) practice Traditional religion.

TABLE 1: Demographics of Respondents
Results in Table 1 shows that: 2 respondents (1.6%) are within ages 8-10 years; 49 respondents (40.8%) are within ages 11-13 years; 49 respondents (40.8%) are within ages 14-16 years and 20 respondents (16.6%) are within ages 17-19 years.

TABLE 1: Demographics of Respondents

Demographics		Frequency	Percentage (%)
Age (years)	0-10	2	1.6
	11-13	49	40.8
	14-16	49	40.8
	17-19	20	16.6
	Total	**120**	**100**
Class	J.S.S 1	15	12.5
	J.S.S 2	15	12.5
	J.S.S 3	15	12.5
	S.S 1	15	12.5
	S.S 2	36	30
	S.S 3	24	20
	Total	**120**	**100**
Resident guardian	Father only	5	4
	Mother only	12	10
	Both parents	93	77.5
	Step parents	8	6.6
	Alone	2	1.6
	Total	**120**	**100**
Religion	Christianity	105	87.5
	Islam	11	9
	Traditional	4	3
	Total	**120**	**100**

Table 2 shows that: 117 respondents (97.5%) have heard about sex education before, while 3 respondents (2.5%) indicated that they have not heard about sex education

before; 34 respondents (28%) said they heard about sex education in the school, 47 respondents (39%) from home, 14 respondents (11.6%) from religious houses, 3 respondents (2.5%) on social media, 4 respondents. (3%) said no radio or television; 3 respondents (2.5%) said from sexual books/ magazine; 7 respondents (5.8%) said on the internet; 5 respondents (2.5%) did not respond because they have not heard about education before; 71 respondents (59%) claim parents are their first sex educator; 22 respondents (18%) said school teachers; 10 respondents (8%) said friends; 14 respondents (11.6%) claim Religious teachers; while 3 respondents (2.5%) did not respond because they have not heard about sex education before; 16 respondents (13%) claim they were introduced to sex education within ages 5-9 year; 79 respondents (65.8%) said within ages 10-14years; 22 respondents (18%) said within ages 15-19 years while 3 respondents (6.5%) did not respond because they have not heard about sex education before; 62 respondents (51.6%) said education is taught in the school; while 58 respondents (48%) said sex education is not taught in the school.

TABLE 2: Responses on Knowledge, Sources, Educators, and Onset of Sex Education

	Response	Frequency	Percentage (%)
Knowledge of sex education	Yes	117	97.5
	No	3	2.5
	Total	120	100
Source of sex education	School	34	28
	Home	47	39
	Religious Houses	14	11.6
	Social Media	3	2.5
	Radio and Television	4	3
	Sexual books/Magazine	3	2.5
	Internet	7	5.8
	Friends	5	4
	No Response	3	2.5
	Total	120	100
Sex educator	Parents	71	59
	School Teachers	22	18
	Friends	10	8
	Religious Teachers	14	11.6
	No response	3	2.5
	Total	120	100
Age first introduced to sex education	5-9	16	13
	10-14	79	65.8
	15-19	22	18
	No Response	3	2.5
	Total	120	100
Sex education taught in School	Yes	62	51.6
	No	58	48
	Total	120	100

Table 3 shows that: 2 respondents (1.6%) view pornographic materials always, 25 respondents (20.8%) view sometimes, 28 respondents (23%) said not anymore while 65 respondents (54%) never viewed; 99 respondents (82.5%) said people are shy to talk about sex education while 21 respondents (17.5%) said people are

not shy to talk about sex education; 28 respondents (23%) said there is enough time for sex education in their school while 92 respondents (76.6%) said there is not enough time for sex education in their school; 75 respondents (62.5%) said there are limited teaching and learning materials for sex education in the school. Meanwhile, 45 respondents (37.5%) said there are enough teaching and learning materials for sex education in the school; 99 respondents (82.5%) said sex education is not included in the school's curriculum, while; 21 respondents (17.5%) said sex education is included in the school's curriculum; 87 respondents (72.5%) said there is no trained counsellor for sex education in their school, while 33 respondents (27.5%) said there is a trained counsellor for sex education in their school; 27 respondents (22.5%) said religion is against sex education while 93 respondents (77.5%) said religion is not against sex education; 32 respondents (26.6%) said that their culture is against sex education while 88 respondents (73%) said that their culture is not against sex education.

TABLE 3: Exposure to Sex Pornography and Sex Education

Question	Response	Frequency	Percentage (%)
How often do you view pornographic materials?	Always	2	1.6
	Sometimes	25	20.8
	Not Anymore	28	23
	Never Viewed	65	54
	Total	120	100
Are people shy to talk about sex education?	Yes	99	82.5
	No	21	17.5
	Total	120	100
Is there enough time for sex education in your school?	Yes	28	23
	No	92	76.6
	Total	120	100
Limited teaching and learning materials for sex education in the school	Yes	75	62.5
	No	45	37.5
	Total	120	100
Is sex education not included in the school curriculum?	Yes	99	82.5
	No	21	17.5
	Total	120	100
There is no trained counsellor for sex education in our school?	Yes	87	72.5
	No	33	27.5
	Total	120	100
Is religion against sex education?	Yes	27	22.5
	No	93	77.5
	Total	120	100
Is culture against sex education?	Yes	32	26.6
	No	88	73
	Total	120	100

Table 4 shows that: 109 respondents (90.8%) said sex education can reduce the rate of unwanted pregnancy, while 11 respondents (9%) said sex education cannot reduce the rate of unwanted pregnancy; 112 respondents (93%) said sex education can reduce the speed of sexually transmitted infections, while 8 respondents 6.6% said sex education cannot reduce the spread of sexually transmitted infections; 9 respondents (7.%%) said sex education encourages them to have sex, while

111 respondents (92.5%) said sex education does not encourage them to have sex; 110 respondents (91.6%) agreed that sex education can change one's sexual attitudes, while 10 respondents (8.3%) did not agree that sex education can change one's sexual attitudes; 105 respondents (87.5%) agreed that sex education can make one to be responsible while; 15 respondents (12.5%) did not agree that sex education can make one table responsible; 42 respondents (35%) said adolescent students are misled by sex education, thereby encouraging dangerous sexual act, while 78 respondents (65%) said adolescent students are not misled by sex education; 113 respondents (94%) agree that lack of proper sex education can lead to rape, while 7 respondents (5.8%) did not agree; 95 respondents (79%) agree that sex education promotes abstinence, while 25 respondents (20.8%) did not agree.

TABLE 4: Effects of Sex Education

Question	Response	Frequency	Percentage (%)
Can sex education reduce the rate of unwanted pregnancy?	Yes	109	90.8
	No	11	9
	Total	120	100
Sex education can reduce the spread of sexually transmitted infections?	Yes	112	93
	No	8	6.6
	Total	120	100
Does sex education encourage me to have sex?	Yes	9	7.5
	No	111	92.5
	Total	120	100
Does sex education change one's sexual attitude?	Yes	110	91.6
	No	10	8..3
	Total	120	100
Sex education can make one to be responsible	Yes	105	87.5
	No	15	12.5
	Total	120	100
Adolescent students are misled by sex education thereby encouraging dangerous sexual act?	Yes	42	35
	No	78	65
	Total	120	100
Lack of proper sex education can lead to rape	Yes	113	94
	No	7	5.8
	Total	120	100
Sex education promotes abstinence	Yes	95	79
	No	25	20.8
	Total	120	100

Table 5 shows that: 115 respondents (95.8%) support that sex education should be taught in the school, while 5 respondents (4%) did not support; 108 respondents (90%) support that sex education should be included in the school's curriculum, while 12 respondents (10%) did not support it; 110 respondents (91.6%) agree that parents should be involved in sex education, while 10 respondents (8.3%) did not agree; 111 respondents (92.5%) agree that religious houses should teach adolescents on sex education, while 9 respondents (7.5%) did not agree; 111 respondents (92.5%) support that government should promote sex education in schools, while 9 respondents (7.5%) did not support it; 112 respondents (93%) support that community should promote sex education among adolescent while; 8 respondents (6.6%) did not support it; 115 respondents (95.8%) support that school should a trained counsellor for sex education, while 5 respondents (4%) did not support.

Table 5: Promotion of Sex Education

Question	RESPONSE	FREQUENCY	PERCENTAGE (%)
Sex education should be taught in the school	Yes	115	95.8
	No	5	4
	Total	120	100
Sex education should be included in the school's curriculum	Yes	108	90
	No	12	10
	Total	120	100
Parents should be involved in sex education programme	Yes	110	91.6
	No	10	8.3
	Total	120	100
Religious houses should teach adolescents on sex education	Yes	111	92.5
	No	9	7.5
	Total	120	100
Government should promote sex education in schools	Yes	111	92.5
	No	9	7.5
	Total	120	100
Community should promote sex education among the adolescents	Yes	112	93
	No	8	6.6
	Total	120	100
Should school have a trained counsellor for sex education?	Yes	115	95.8
	No	5	4
	Total	120	100

4.0 DISCUSSION

The study revealed that 97.5% of respondents were aware of sex education, though the sources varied widely: 28% learned about it from school, 39% from home, 11.6% from religious institutions, 2.5% from social media, 3% from radio/television, 2.5% from sexual books and magazines, 5.8% from the internet, and 4% from friends. This reflects the diverse ways sex education is disseminated, with 59% identifying parents as their primary source. This may explain gaps in understanding, as parents often have limited formal knowledge on the subject (Niraula, 2021). Other significant sources were school teachers (18%), friends (8%), and religious teachers (11.6%).

Regarding the age at which respondents first encountered sex education, 65.8% were introduced between 10 and 14 years old, 13% between 5 and 9 years old, and 18% between 15 and 19 years old. This aligns with Narkarat et al. (2021), who noted the importance of timely sexual health education for adolescent understanding. The study also found that 1.6% of respondents frequently viewed pornographic material, 20.8% viewed it occasionally, and 23% had viewed it in the past but no longer did. This varied exposure highlights the need for comprehensive sexual education to address such influences effectively.

The factors impacting sex education were identified as follows: a majority (51.6%) of respondents reported that sex education is not included in the school curriculum, while a significant proportion (82.5%) expressed discomfort in discussing the topic. Also, a substantial percentage (76.6%) of respondents noted that insufficient time is allocated for sex education in schools. Additionally, 62.5% mentioned inadequate teaching materials, and 82.5% stated that sex education was not included in the official curriculum. These findings are consistent with Rahmani et al. (2018) and Annabelle (2018), who both documented resistance to sex education due to cultural and religious concerns, reflecting a broader issue of integrating sex education into educational systems. The absence of trained counselors, noted by 72.5% of respondents, further underscores the lack of support structures in schools.

The impact of sex education was highlighted by 90.8% of respondents who believed it could reduce unwanted pregnancies by promoting contraceptive use, and 93% thought it could prevent sexually transmitted infections through increased awareness of preventive measures.

This aligns with UNESCO (2022), which asserts that well-designed sex education helps adolescents navigate sexual risks and manage peer pressures. Conversely, 7.5% of respondents felt that sex education might encourage sexual activity, while 92.5% disagreed. This concern resonates with Rahmani et al. (2018), who found some individuals feared that sex education might lead to increased sexual curiosity.

Additionally, 91.6% of respondents believed that sex education could positively influence sexual attitudes, and 87.5% felt it could promote responsibility. These findings support UNESCO's (2022) assertion that comprehensive sex education fosters responsible sexual behavior and moral development. However, 35% of respondents expressed concern that sex education might lead to risky sexual behaviours, similar to concerns raised by Rahmani et al. (2018). Furthermore, 94% of respondents felt that inadequate sex education could contribute to rape, and 79% believed it promotes abstinence, which supports the Guttmacher Institute's (2022) findings that effective sex education empowers youth to make informed decisions about relationships and reproduction.

5.0 CONCLUSION

The study concludes that while respondents possess some knowledge of sex education, several factors undermine its effectiveness, including its absence from school curricula and reliance on home-based information. To address these gaps, integrating sex education into school curricula, involving parents and religious institutions, ensuring trained counselors are available, and promoting sex education through government and community efforts are essential.

5.1 RECOMMENDATIONS

Based on the findings, the following recommendations are proposed:

- The government should initiate extensive public awareness campaigns on sex education.
- Organise seminars and workshops to train secondary school teachers on sex education.
- Integrate sex education into the secondary school curriculum to support adolescent students.
- Curriculum planners should revise school curricula to include culturally sensitive sexuality education.
- Implement a standardized approach to sex education across secondary schools.
- Schools should employ trained counselors dedicated to sex education programmes.
- Provide sufficient teaching and learning resources for sex education.
- Encourage parents to begin sex education early, as they are often the first educators on this topic.

REFERENCES

Chinelli, A., Salfa, M. C., Cellini, A., Ceccarelli, L., Farinella, M., Rancilio, L., Galipò, R., Meli, P., Camposeragna, A., Colaprico, L., Oldrini, M., Ubbiali, M., Caraglia, A., Martinelli, D., Mortari, L., Palamara, A. T., Suligoi, B., & Tavoschi, L. (2022). Sexuality education in Italy 2016-2020: A national survey investigating coverage, content and evaluation of school-based educational activities. *Sex Education*, *23*(6), 756-768. https://doi.org/10.1080/14681811.2022.2040215

Chizoba, A. F., Chineke, H. N., Adogu, P. O., Nwafia, A. E., & Chizoba, C. (2020). Overview of HIV risk reduction interventions among adolescents: A call to evaluate the HIV education curriculum in Nigeria. *International STD Research & Reviews*. https://doi.org/10.9734/isrr/2020/v11i430211

Narkarat, P., Taneepanichskul, S., Kumar, R., & Somrongthong, R. (2021). Effects of mobile health education on sexual and reproductive health information among female school-going adolescents of rural Thailand. *F1000Research*, *10*, 368. https://doi.org/10.12688/f1000research.53377.1

Niraula, R. (2021). The understanding of the difference between sex and gender among secondary level students in Nepal. *Open Journal of Social Sciences*, *9*(6), 171-184. https://doi.org/10.4236/jss.2021.96014

Ogundiran, T. A., Mohammadnezhad, M., Ibrahim Ogundiran, A., & Mohammed, H. (2024). Role of sociocultural beliefs/norms on level of access and uptake of contraceptives among unmarried adolescent girls in Nigeria: A systematic review study. *MOJ Public Health*. https://doi.org/10.15406/mojph.2024.11.00444

Okooboh, G. O., & Martins, O. F. (2023). A systematic review of the evidence on the effectiveness of sexuality education interventions on young people's sexual and reproductive health outcomes in Nigeria. *International Journal of Community Medicine and Public Health*, *10*(1), 10-18. https://doi.org/10.18203/2394-6040.ijcmph20233077

Rahmani, A., Merghati, K. E., & Fallahi, A. (2018). Perceived advantage and disadvantages of sex education in young women. *International Journal of High Risk Behaviour and Addiction*, *7*(2), e57221. https://doi.org/10.5812/ijhrba.57221

Taiwo, M. O., Oyekenu, O., & Hussaini, R. A. (2023). Understanding how social norms influence access

to and utilization of adolescent sexual and reproductive health services in Northern Nigeria. *Frontiers in Sociology, 8*. https://doi.org/10.3389/fsoc.2023.1135119

UNESCO. (2022). Why comprehensive sexuality education is important. Retrieved from https://en.unesco.org/news/why-comprehensive-sexuality-education-important

Vanwesenbeeck, I. (2020). Comprehensive sexuality education. Retrieved from https://doi.org/10.1093/acrefore/9780190632366.0

13.205

Zulaika, G., Bulbarelli, M., Nyothach, E., van Eijk, A. M., Mason, L., Fwaya, E., Obor, D., Kwaro, D., Wang, D., Mehta, S. D., & Phillips-Howard, P. A. (2022). Impact of COVID-19 lockdowns on adolescent pregnancy and school dropout among secondary schoolgirls in Kenya. *BMJ Global Health, 7*(5), e008691. https://doi.org/10.1136/bmjgh-2021-008691

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

KNOWLEDGE, ATTITUDE AND MANAGEMENT OF ADVERSE EVENTS FOLLOWING COVID-19 VACCINATION AMONG HEALTH WORKERS OF ILEJEMEJE LOCAL GOVERNMENT AREA, EKITI STATE

Francisca Chinyere ADEBAYO, Abiodun Gideon FATOKUNBO and Rachael Yetunde IBIDUNMOYE
Corresponding email: abey3.16@gmail.com

ABSTRACT
The COVID-19 pandemic, originating in Wuhan, China in December 2019 which rapidly spread globally. It was declared a public health emergency of International concern on January 30, 2020, and later a pandemic on March 11, 2020. This unprecedented global health crisis had posed significant challenges to healthcare systems globally. Despite the availability of several approved COVID-19 vaccines, their uptake has been hindered by various factors including social, traditional, and religious beliefs. This study aims to investigate the knowledge, attitudes, and management practices regarding adverse events following COVID-19 vaccination among health workers in Ilejemeje Local Government Area, Ekiti State, Nigeria. Total enumeration sampling technique was used to select 116 respondents for the study. Four research objectives with two null hypotheses were used to guide the study. A self-developed validated questionnaire was used as instrument for data collection. Data was analyzed using frequency counts, percentage and Chi-square X^2. Findings revealed that 74.1% had prior awareness of adverse event following immunization, 64.7% correctly identified it whiile 56.0% had received training on AEFI. Attitudinally, 38.8% were willing to receive the second dose of vaccine, 61.2% demonstrated negative attitudes towards AEFI. 62.9% exhibited good practices such as reporting AEFI and utilizing recommended interventions. Significant association was found between sociodemographic characteristics and knowledge of AEFI of Covid-19 vaccines of health workers' ($\chi^2 = 3.672$, $p = 0.045$). Effective strategies are crucial to improve health workers knowledge, attitude and management practices thereby enhancing Covid-19 vaccine uptake.confidence.

Keywords: *Adverse events manageent, AEFI Covid-19 immunization,Health workers attitude, Health Health workers knowledge.*

1.0 INTRODUCTION
COVID-19 is a respiratory illness that is fast spreading across the world. It is a new strain/type of coronavirus and was first found in Wuhan, China in December 2019. World Health Organization (WHO) on 30th January 2020 declared COVID-19 a Public Health Emergency of International Concern (PHEIC) and a pandemic on 11th March 2020. This hastily became a global threat affecting over 220 countries. As of 22 December 2020, the COVID-19 pandemic had resulted in more than 76.2 M cases and more than 1.6 M deaths worldwide (World Health Organization, 2020). The pandemic has resulted in a devastating impact worldwide, which prompted the need for mitigation policies to contain the pandemic(WHO, 2021). The ground strategy followed by most countries around the world was to reduce the transmissibility of the disease, often by non-pharmaceutical interventions (NPIs), including enforcing masks policy, hands sanitization, social distancing, travel restrictions, schools' closures, and partial or complete lockdowns (Nicola, et al, 2020).

The Coronavirus Disease 2019 (COVID-19) pandemic caused severe disruptions in unprecedented challenges for healthcare systems worldwide. COVID-19 primarily affects the respiratory system with a range of symptoms from mild rhinorrhea to severe respiratory distress syndrome (Huang, Wang, Li, Ren, Zhoa & Hu, 2020). This virus is generally more fatal for the elderly and those with a history of co-morbidities, such as hypertension, obesity, diabetes, and kidney disease (Grasangrillo et al,. 2020).

African healthcare systems were not well-equipped to tackle this pandemic. While African countries are at a higher risk of disease spread due to limited health infrastructure and training, their inability to promptly obtain the vaccine further increases the risk of disease spread. Not only have many developed countries ordered most of the vaccine supplies, but vaccine-related costs and transfer issues may also further delay vaccination procedures for African people as far as late 2021 or early 2022 (Elhadi, 2020).

The successful implementation of large-scale comprehensive national immunization programmes and the subsequent eradication or control of smallpox, measles, pertussis, meningococcal meningitis, hepatitis B, tetanus etc. are among the most notable achievements of the 20th centuryand beyond. Immunization has been

regarded as the most cost-effective intervention for health promotion by World Health Organization (WHO,2020). The benefits of immunization apart from reducing cost of disease treatment include ensuring a healthy living, alleviation of family poverty, and suffering. Immunization needs to be offered at every opportunity with the aim of eliminating these vaccine-preventable diseases. Despite significant progress in vaccine preventable disease control, immunization is not free of controversy. Vaccine safety is increasingly becoming important because of alleged safety issues derailing vaccine programs worldwide (Lawal, et al, 2021). An adverse event following immunization (AEFI) is defined as any untoward medical occurrence that follows immunization and which does not necessarily have a causal relationship with the usage of the vaccine. The adverse event may be any unfavorable or unintended sign, abnormal laboratory finding, symptom, or disease (Aderibigbe et al, 2010).

For decades, vaccinations have been considered the best method to control rapidly spreading infectious diseases. That said, many groups and individuals recently started to spread rumors and conspiracy theories aimed against vaccination, intensifying the pressure on healthcare authorities (Elhadi, et al. 2020). Vaccines are one of the most reliable and cost-effective public health interventions ever implemented that are saving millions of lives each year (Hajj, et al, 2015). Following the deciphering of the genome sequence of SARS-CoV-2 in early 2020 and the declaration of the pandemic by WHO in March 2020, scientists and pharmaceutical companies were racing against time in efforts to develop vaccines. As of December 22, 2020, at least 85 vaccines were in preclinical development in animals and 63 were in clinical development in humans, of which 43 in phase I, 21 in phase II, 18 in phase III, 6 have been approved for early or limited use, 2 have been approved for full use, and one vaccine has been abandoned. Pfizer-BioNTech's (BNT162b2) and Moderna (mRNA-1273) mRNA vaccines were approved for emergency use in the US (Zimmer et al, 2020).

COVID-19 vaccine development and supply is an ongoing process; in Europe and North America, several candidate vaccines from well-known companies have been released for healthcare workers and high-risk populations such as the elderly and patients with chronic diseases (Lurie, et al, 2020). However, low- and middle-income countries are at risk of vaccination delays due to several reasons: lack of public trust, shortage of resources, and scarcity of vaccination supply as many high-income countries secure a large amount of the new vaccines, without prioritizing other countries. Consequently, this inequality can leave low and middle-income countries at a disadvantage, given their low ability to fight COVID-19 with the current status of their healthcare system, leading to humanitarian crises (Elhadi, et al. 2020).

In many parts of the country, despite the surge in Covid-19 cases and the corresponding campaign on availability of its vaccines in the country continued their normal routines and social activities without strict adherence to the sketchy preventive measures outlined by Nigeria Centre for Disease Control (NCDC), nor the willingness to participating in the uptake of Covid-19 Vaccines (Nwosu, 2021). This is because till date, many believe that COVID-19 is not of any concern while others believe it doesn't exist (Nwosu, 2021). Also, with the deteriorating system of education and health policies and strategies in the country, the society's immediate conclusion and misinformation on those vulnerable to the disease and who is to take the Covid-19 vaccine emanated, thus limiting their rate of voluntary response to accepting vaccination, coupled with the fact that there are circulations of negative information regarding the side effect of Covid-19 vaccines in the body (Ige, 2021).

According to Onohua (2021) in his study carried out in a minor group of health workers in south eastern Nigeria, the respondents who took the first does of the Covid-19 vaccines, reported several side effects such as: fever, headache, pain at the site of injection, general body weakness, muscle aches, etc., and this experience have affected their willingness to take the second dose. Although he also reported that although was a slight increase in the uptake of the covid-19 vaccine in the country, however, this is partly due to the compulsory policy of no covid-19 vaccination evidence, no access to certain national and international tours. This study therefore sought to examine the knowledge, attitude, management of adverse events following covid-19 vaccination among health workers of Ilejemeje local government area, Ekiti State.

There have been several reported cases of adverse event following immunization (AEFI) of the novel Coronavirus vaccination globally, where front-line workers such as the health care workers, military personnel, and other personnel who hold public service positions have reported some mild, moderate and severe side effects (e.g. high fever, headache, fatigue, general body pain, dizziness, etc.) following the uptake of the Coronavirus vaccines. These have hampered the willingness of others as well as the uptake of the second dose of the Covid-19 vaccine due to attitude and practices that are unfavourable (NCDC, 2021). Despite having a number of COVID-19 vaccines available and

approved for public use, the uptake was low. Some of the reasons for this low uptake may include: level of trust in the healthcare system, presence of conspiracy theories, social, traditional and religious beliefs, social media, fear of untoward side effects, personal risk perception, etc.

The researcher also noticed that some health workers in Ilejemeje local government area, Ekiti state affirmed in course of conversation their unwillingness to take the Covid-19 vaccines due to purported rumors they have gathered from people and the social media as a result of the uptake of the vaccine. Hence, determining the knowledge, attitude andmanagement towards adverse events Following Immunization (AEFI) of Covid-19 vaccines among Health Workers of Ilejemeje Local Government Area(LGA), Ekiti state, became the center focus of this study.

Specific objectives

This study aims to accomplish the following specific objectives:

1. To determine the knowledge of Health Workers of Covid-19 vaccination in Ilejemeje local government area, Ekiti state.

2. To identify the attitude of Health Workers towards Covid-19 vaccination in Ilejemeje local government area, Ekiti state.

3. To determine the prevalence of AEFI of Covid-19 among Health Workers in Ilejemeje local government area, Ekiti state.

4. To determine the management of Covid-19 vaccination AEFI in Ilejemeje local government area, Ekiti state.

Research questions

This study answered to the following research questions:

1. What is the knowledge of AEFI of Covid-19 vaccination among Health Workers in Ilejemeje local government area, Ekiti state?

2. What are the attitudes Health Workers towards AEFI of Covid-19 vaccination in Ilejemeje local government area, Ekiti state?

3. What is the prevalence of AEFI of Covid-19 among Health Workers in Ilejemeje local government area, Ekiti state?

4. How do Health Workers manage Covid-19 vaccination AEFI in Ilejemeje local government area, Ekiti state?

Hypotheses

$H_0$1: There is no significant association between health workers' sociodemographic factors and their knowledge of Adverse Events Following Covid-19 Vaccination (AEFI).

$H_0$2: There is no significant association between health workers' sociodemographic factors and their attitudes towards Adverse Events Following Covid-19 Vaccination (AEFI).

$H_0$3: There is no significant association between health workers' sociodemographic factors and their management of Adverse Events Following Covid-19 Vaccination (AEFI).

H04: There is no significant association between health workers' knowledge of Adverse Events Following Covid-19 Vaccination (AEFI) and their management of AEFI.

2.0 METHODOLOGY

This study was carried out in Ilejemeje Local Government Area (LGA), Ilemeje shares boundaries Ilejemeje Local government shares boundaries with Ekiti-Kwara local government on the North, Ido/osi local government on the South, Oye local government on the East, and Moba local government on the We has its headquarters in Edaoniyo. It is made up of seven (7) communities which includes: Ewu Ekiti, Iye Ekiti, Ijesamodu Ekiti, Iludun Ekiti, Ipere Ekiti, Ijaro Ekiti and Edaoniyo Ekiti with their respective markets. Ilejemeje has fourteen (14) health care facilities primary, iclusive of a comprehensive health centers, Private and a state general hospital. It also has one (1) police station, Egungu, Epa and Agere festivals. The inhabitants of Ilejemeje are predominantly farmers, traders and civil servants. The study population comprrised of all Health Workers(Doctors, Community Health Officers, Nurse/Midwives, Community Health Extension Workers, Junior Community Health Extension Workers, Health Recorders, Health Assistance, Health Assistants), in Ilejemeje local government area, Ekiti state. The research design used in this study was a descriptive cross-sectional survey.

Data collected from the Ilejemeje Local Government Council Secretariat shows that as at July, 2021, there were 116 Health Care Workers from the public health facilities which include: four doctors three community health officers (CHO), 25 Nurse/Midwives, 23 Community Health Extension Workers, five Junior Community Health Extension Workers, 24 Health Recorders, 27 Health Attendants and 5 Health Assistants. Total enumeration method was used to include all the

health workers (front-line workers) in the health facilities eligible to take Covid-19 vaccines. Hence, the sample size used for the study were 116 respondents.

Research instrument

A semi-structured questionnaire was used to collect data from the respondents who were required to choose which option best represent their interest The research questionnaire was divided into five (5) sections. Section A consist of the demographic characteristics of the respondent Section B consist of the respondents' knowledge on AEFI of Covid-19 vaccines

Section C consist of the attitude of respondents towards AEFI of Covid-19 vaccines
Section D consist of management AEFI of Covid-19 vaccines
Section E consist of prevalence of AEFI of Covid-19 vaccination among respondents

Validity of the research instrument

The instrument developed by the researcher, was reviewed, scrutinized and validated by experts in the field of communicable disease epidemiology.

Reliability of the instrument

In order to confirm the reliability of the research instrument, a test-retest method was used, where 5 copies of the research instrument were administered to Health Workers in Ekiti-kwara LGA and the result analyzed accordingly.

Pilot study

A pilot study was carried out where 10 Health Workers were selected at random from Ido/Osi local government and the result analyzed accordingly.

Data collection and analysis

The research questionnaire were distributed to health workers in Ilejemeje LGA. The instrument was explained to the respondents to enable them answer the research instrument accurately. Data obtained, were analyzed using the statistical package for Social Sciences (SPSS) version 25. The findings were presented using descriptive statistical tools such as frequency count, percentages and chi-square.

Ethical considerations

An ethical approval was obtained from the University of Ibadan, University College Hospital (UI/UCH) Ethical committee. An introduction seeking for respondents' consent was attached in front of the research questionnaire to request for respondents' consent in participating in the study.

3.0 RESULTS

The result of the gender and categories of respondents are presented in figure 1 and 2. Figure 1 showed that 27(23%) of the respondents are males while 89(77%) are females.

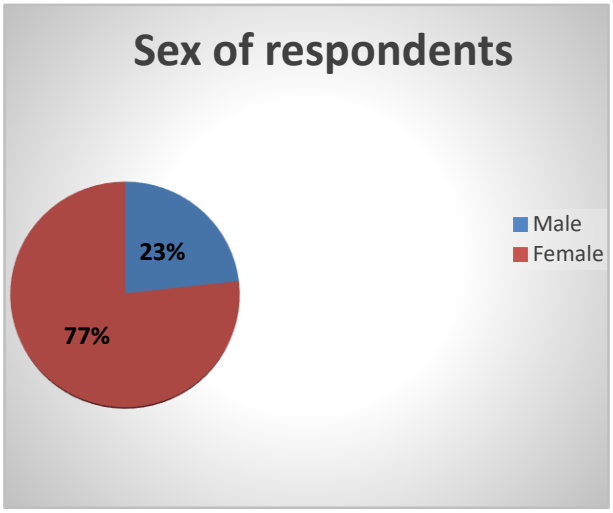


Figure. 1: A pie chart showing sex of respondents

Figure 2 showed that, 4(3.4%) of the respondents are Doctors, 3(2.6%) are CHOs, 25(21.6%) are Nurse/Midwives, 28(24.1%) are CHEW/JCHEWs, 24(20.7%) are Health Recorders, 27(23.3%) Health Attendants and 5(4.3%) are Health Assistants.

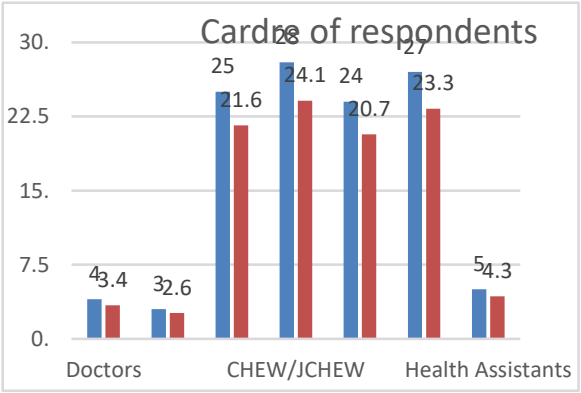
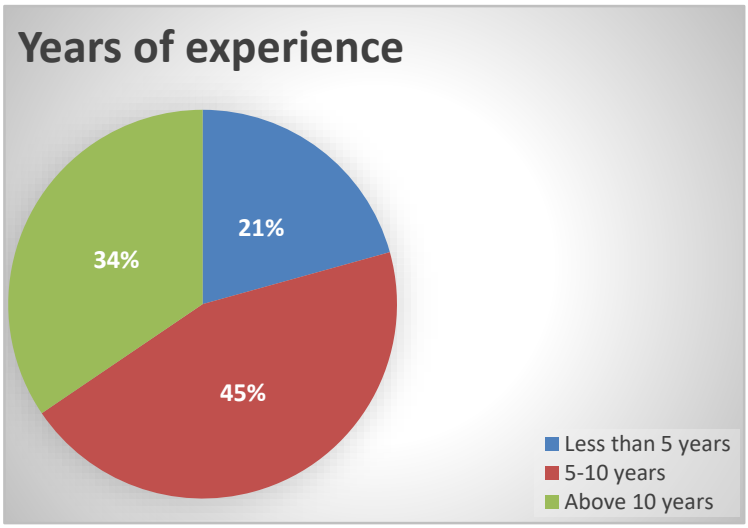


Figure. 2: A bar chart showing the cadre of respondents

The result of years of expereince is in figure 3 and shows that 24(21%) have work expereinces less of less than 5years 52(45%) of respondents have work experiences of 5-10years and 40(34%) have work expereience of above

10years

Fig. 3: A pie chart showing the years of experience of respondents.



From fig. 4: 37(31.9%) of the respondent are within the age of 18-27 years, 52(44.8%) are within the age of 28-37 years while 27(23.3%) are within the age of 38 years and above.

Fig. 4.: A bar chart showing age of respondents.

From fig. 5 above, 82(71%) of the respondents are Christians, 31(27%) are of the Islamic religion and 3(2%) are of traditional religion.

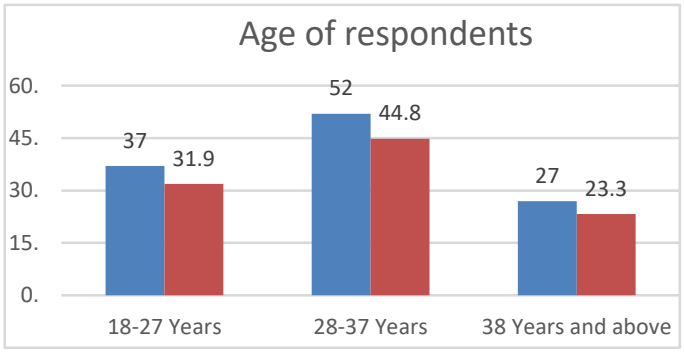
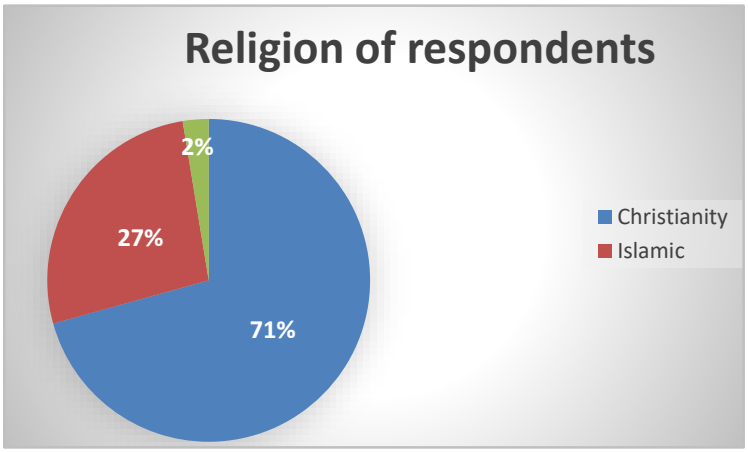


Fig. 5: A pie chart showing religion of respondents

Table 1: Knowledge of respondents on AEFI of Covid-19 vaccination

(N=116)



Variables	Yes		No	I don't know		
	Freq.	%	Freq.	%	Freq.	
Have you heard of AEFI?	86	74.1	30	25.9	-	-
AEFI means Adverse Events Following Immunization	75	64.7	31	26.7	10	8.6
Have you had any training on AEFI before?	65	56.0	40	34.5	11	9.5
AEFI can result from wrong injection procedure	60	51.7	45	38.8	11	9.5
AEFI can be caused by low potency vaccine	70	60.3	30	25.9	16	13.8
AEFI is a coincidence after vaccination	56	48.3	48	41.4	12	10.3
AEFI are associated with fever, pain, swelling of the site of injection.	75	64.7	30	25.9	11	9.4

From table 1 above, 86(74.1%) of the respondent have heard of AEFI, while 30(25.9%) of have not heard about it. 75(64.7%) of the respondent agreed that AEFI is Adverse Events Following Immunization, while 31(26.7%) disagreed and 10(8.6%) said they don't know the meaning of AEFI. Finding further shows that 65(56.0%) of the respondents who participated in this study had a training on AEFI, and 40(34.5%) have not had training on AEFI before while 11(9.5%) of the respondent did not know about any training it. 60(51.7%) of respondents attested that AEFI can result from wrong injection procedure, while 45(38.8) disagreed and 11(9.5%) are not sure. The table also revealed that 70(60.3%) of the respondent agree that AEFI can be caused by low potency vaccine and 30(25.9%) disagree while 16(13.8) of the respondents don't know the cause. 56(48.3%) of the respondents said that AEFI is a coincidence after vaccine while 48(41.4%) disagreed and 12(10.3) are not sure. And the table also shows that 75(64.7%) of the respondents attested that AEFI are associated with fever, pain, swelling of the site of injection while 30(25.9%)of the population disagree and 11(9.4%) don't know about it.

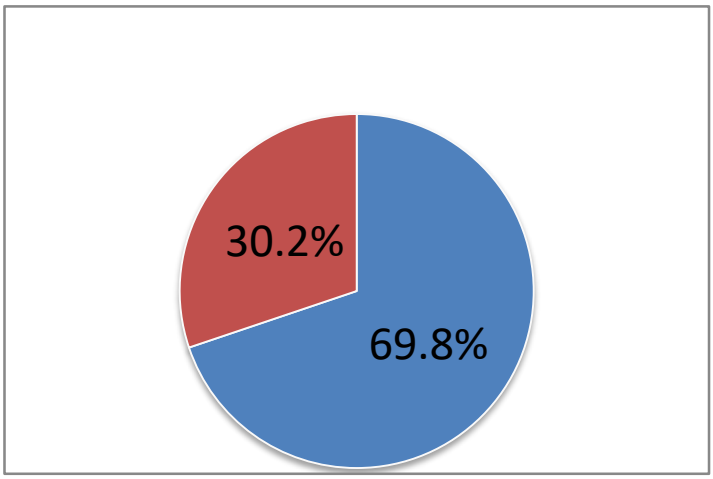


Figure .6 Knowledge Score of Respondents

The respondents' knowledge was computed, resulting in a mean score of 4.20±1.30. Respondents who scored below the mean were categorised as having poor knowledge, while those who scored the mean or above were categorised as having good knowledge. Overall, 81 respondents (69.8%) demonstrated good knowledge, while 35 respondents (30.2%) demonstrated poor knowledge (Figure 4.6)

Table 2: Attitude of respondents towards AEFI of Covid-19 vaccination (N=116)

Variables	Yes		No		I don't know	
	Freq.	%	Freq.	%	Freq.	
Will you still take the Covid-19 vaccines second dose despite the experience of AEFI from first dose or of others?	45	38.8	55	47.4	16	13.8
Do you think there is any need of reporting AEFI post Covid-19 vaccination?	40	34.5	60	51.7	16	13.8
Do you encourage your friends and family to take the Covid-19 vaccine their experience as regards AEFI?	50	43.1	62	53.4	4	3.4
Do you think the AEFI of Covid-19 vaccines are the same as other vaccines AEFI?	45	38.7	55	47.4	16	13.7

Table 4.1.2: 45(38.7%)of the respondent attested to take second dos despite their experience of AEFI on the first dose while 55(47.4) of the respondents disagreed to take the second dose of the vaccine and 16(13.8%) were not sure either to take the vaccine or not. The table narrated that 40(34.5%) of the respondents agreed to the reporting of AEFI post of Covid-19 vaccine and 60(51.7%) disagreed while 16(13.8%) of the population are not sure, 50(43.1%) of the population attested that they encourage their friends and family to take the Covis-19 vaccine while 62(53.4%) of the respondents disagreed and 4(3.4%) of the respondents don't know. The table also revealed that 45(38.7%) of the population agreed that AEFI of Covi-10 vaccine is the same as other vaccine AEFI while 55(47.4%) disagreed and 16(13.7%) of the populations did not agreed neither disagreed to the question.

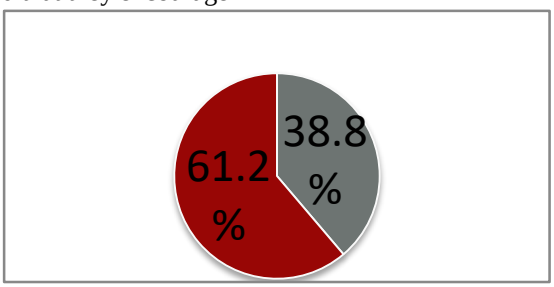


Figure 7 Pie chart showing Attitude Score of Respondents

The respondents' attitude was computed, resulting in a mean score of 3.90±1.00. Respondents who scored below the mean were categorised as having negative attitudes, while those who scored the mean or above were categorised as having positive attitude. Overall, 45 respondents (38.8%) demonstrated positive attitude, while 71 respondents (61.2%) demonstrated negative attitudes (Figure 4.7).

Table 3: Management of AEFI of Covid-19 by respondents (N=116)

Variables	Yes		No	
	Freq.	%	Freq.	%
Did you partake in the first dose of the Covid-19 Vaccination?	70	60.3	46	39.6
If yes to the question above, did you have any AEFI after the first dose? (N=70)	51	43.9	19	16.4
Did you take the second dose of the Covid-19 vaccination? (N=70)	45	64.3	25	35.7
If yes to the question above, did you had any form of AEFI? (N=45)	38	84.4	7	15.6
If yes to question above, did you reported any of AEFI to the appropriate personnel? (N=70)	39	55.7	31	44.2
If there was any form of AEFI, which of the following below did you do as control measure? (N=70)				
Took analgesic	60	85.7	10	14.3
Used cold compress	61	87.2	9	12.8
Ignored the symptoms	65	92.9	5	7.1

Table 3: The table indicated that 70(60.3%) of the respondents partake in the first dose of Covid-19 vaccination while 46(39.6%) of the population did not, 51(43.9%) of the respondents attested that they had AEFI after the first dose and 19(16.4%) did not had AEFI on their first dose. 45(64.3%) of the respondents took the second dose of covid-19 vaccine, while 25(35.7%) of the population did not partake in the second dose of covid-19 vaccination. The table also shown that 38(84.4%) of the respondents had one form of AEFI or the other after the second dose of the Covid-19 vaccine, while 7(15.6%) did not had any sign of AEFI. 39(55.7%) of the respondents reported AEFI to the appropriate personnel while 31(44.2%) of the population did not, 60(85.7%) of the population took analgesic to control AEFI while10(14.3%) did not take any analgesic, 61(87.2%) of the population attested that they used cold compress to control AEFI and 9(12.8%) did not take any. And also the table revealed that 65(92.9%) of the population ignored the symptom of AEFI while 5(7.1%) did not ignore.

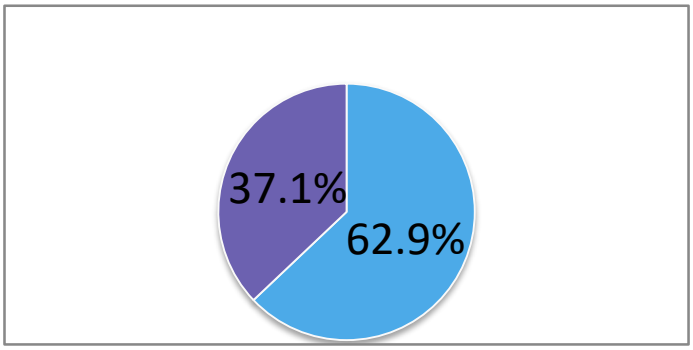


Figure 8 Pie Chart showing Management Score of Respondents

The respondents' Management of AEFI was computed, resulting in a mean score of 3.70±1.41. Respondents who scored below the mean were categorised as having poor management, while those who scored the mean or above were categorised as having good management. Overall, 73 respondents (62.9%) demonstrated good management, while 43 respondents (37.1%) demonstrated poor management (Figure 4.8).

Table 4: Prevalence of AEFI of Covid-19 among respondents

Variables	Yes	
	Freq.	%
Which of the AEFIs below did you experience or was most common among people you know that took the Covid-19 vaccines? (N=70)		
Fever	60	85.7
Headache	55	78.6
Pain and numbness at the site	65	92.9
Redness and swelling of the site	50	71.4
Cold, cough and catarrh	40	57.1
Abscess	45	64.3
Weakness	70	100
Sleepiness	60	85.7

Table 4: Showed that 60(85.7%) of the respondent's experience fever after taking the vaccine while 55(78.6%) of the population attested that they experience headache after taking the vaccine and 65(92.9%) of the respondents experience pain and numbness at the site while 50(71.4%) of the population experience redness and swelling of the site and the table also revealed that 40(57.1%) of the respondents experienced cold, cough and catarrh, while 45(64.3%) of the population experienced abscess while the table shows that 70(100%) of the population experienced weakness after taking the vaccine while 60(85.7%) of the respondents experience sleepiness after taking the vaccine.

Table 5: Association between Demography and Knowledge of AEFI of COVID Vaccine

	Good Knowledge N (%)	Poor Knowledge N (%)	Chi-square Value	p-value
Gender			4.153	0.041*
Male	15 (55.6)	12 (44.4)		
Female	66 (74.2)	23 (25.8)		
Cadre			2.145	0.231
Doctor	2 (50.0)	2 (50.0)		
CHO	1 (33.3)	2 (66.7)		
Nurse/Midwife	18 (72.0)	7 (28.0)		
CHEW/JCHEW	15 (53.6)	13 (46.4)		
Health Recorder	12 (50.0)	12 (50.0)		
Health Attendant	16 (59.3)	11 (40.7)		
Health Assistant	3 (60.0)	2 (40.0)		
Religion			3.672	0.055
Christian	58 (70.7)	24 (29.3)		
Islamic	21 (67.7)	10 (32.3)		
Traditional	2 (66.7)	1 (33.3)		
Years of Experience			4.233	0.034*
< 5 years	10 (41.7)	14 (58.3)		
5-10 years	40 (76.9)	12 (23.1)		
> 10 years	31 (77.5)	9 (22.5)		
Age Group			3.672	0.045*
18-27 years	18 (48.6)	19 (51.4)		
28-37 years	48 (92.3)	4 (7.7)		
38 years and above	15 (55.6)	12 (44.4)		

The analysis of the association between health workers' sociodemographic characteristics and their knowledge of Adverse Events Following Immunization (AEFI) of Covid-19 vaccines reveals several significant findings.

Gender was found to be statistically significant (χ^2 = 4.153, p = 0.041). Specifically, female health workers were more likely to have good knowledge (74.2%) compared to their male counterparts (55.6%). This suggests that gender plays a role in the level of knowledge about AEFI among health workers, with females being more knowledgeable.

Years of experience also showed a significant association with knowledge (χ^2 = 4.233, p = 0.034). Health workers

with more than 10 years of experience (77.5%) and those with 5-10 years of experience (76.9%) were more likely to have good knowledge compared to those with less than 5 years of experience (41.7%). This indicates that experience is a crucial factor in understanding AEFI, with more experienced health workers being better informed.

Age group was another significant factor ($\chi^2 = 3.672$, $p = 0.045$). Health workers aged 28-37 years demonstrated the highest level of good knowledge (92.3%), followed by those aged 38 years and above (55.6%), and those aged 18-27 years (48.6%). This finding suggests that middle-aged health workers are the most knowledgeable about AEFI.

In conclusion, the null hypothesis stating that there is no significant association between health workers' sociodemographic characteristics and their knowledge of AEFI of Covid-19 vaccines is rejected. Gender, years of experience, and age group significantly influenced the knowledge levels of health workers regarding AEFI.

Table 6: Association between Demography and Attitude

$H_0$2: There is no significant association between health workers' sociodemographic characteristics and their attitudes towards AEFI of Covid-19 vaccines.

	Positive Attitude N (%)	Negative Attitude N (%)	Chi-square Value	p-value
Gender				
Male	10 (37.0)	17 (63.0)	2.874	0.090
Female	35 (39.3)	54 (60.7)		
Cadre				
Doctor	1 (25.0)	3 (75.0)	0.587	0.444
CHO	1 (33.3)	2 (66.7)		
Nurse/Midwife	22 (55.0)	18 (45.0)		
CHEW/JCHEW	15 (53.6)	13 (46.4)		
Health Recorder	5 (20.8)	19 (79.2)		
Health Attendant	3 (11.1)	24 (88.9)		
Health Assistant	0 (0.0)	5 (100.0)		
Religion				
Christian	32 (39.0)	50 (61.0)	1.329	0.248
Islamic	16 (51.6)	15 (48.4)		
Traditional	0 (0.0)	3 (100.0)		
Years of Experience				
< 5 years	8 (33.3)	16 (66.7)	1.587	0.207
5-10 years	27 (51.9)	25 (48.1)		
> 10 years	10 (25.0)	30 (75.0)		
Age Group				
18-27 years	8 (21.6)	29 (78.4)	2.987	0.084
28-37 years	26 (50.0)	26 (50.0)		
38 years and above	12 (44.4)	15 (55.6)		

The analysis from table 6 showed that there was no statistically significant association between health workers' sociodemographic characteristics and their attitudes towards AEFI of Covid-19 vaccines. The p-values for all demographic variables, including gender, cadre, religion, years of experience, and age group, were greater than 0.05. Therefore, we fail to reject the null hypothesis, indicating that these sociodemographic

factors do not significantly influence the attitudes of health workers towards AEFI of Covid-19 vaccines.

Table 7: shoiwng association between health workers' sociodemographic characteristics and their management of AEFI of Covid-19 vaccines.

	Good Management N (%)	Poor Managment N (%)	Chi-square Value	p-value
Gender				
Male	12 (44.4)	15 (55.6)	3.210	0.073
Female	33 (37.1)	56 (62.9)		
Cadre				
Doctor	2 (50.0)	2 (50.0)	4.587	0.032*
CHO	1 (33.3)	2 (66.7)		
Nurse/Midwife	21 (52.5)	19 (47.5)		
CHEW/JCHEW	12 (42.9)	16 (57.1)		
Health Recorder	6 (25.0)	18 (75.0)		
Health Attendant	5 (18.5)	22 (81.5)		
Health Assistant	0 (0.0)	5 (100.0)		
Religion				
Christian	31 (37.8)	51 (62.2)	1.987	0.158
Islamic	14 (45.2)	17 (54.8)		
Traditional	0 (0.0)	3 (100.0)		
Years of Experience				
< 5 years	10 (41.7)	14 (58.3)	4.321	0.038*
5-10 years	29 (55.8)	23 (44.2)		
> 10 years	6 (15.0)	34 (85.0)		
Age Group				
18-27 years	7 (18.9)	30 (81.1)	3.729	0.054
28-37 years	26 (50.0)	26 (50.0)		
38 years and above	12 (44.4)	15 (55.6)		

The analysis of the association between sociodemographic characteristics and the management of AEFI of Covid-19 vaccines revealed some statistically significant findings. Specifically, the cadre of health workers was significantly associated with the management of AEFI ($\chi^2 = 4.587$, $p = 0.032$). Among the different cadres, Nurse/Midwives were more likely to

demonstrate good management of AEFI compared to others.

Additionally, the years of experience of the health workers also showed a significant association with the management of AEFI ($\chi^2 = 4.321$, $p = 0.038$). Health workers with 5-10 years of experience were more likely to exhibit good management practices compared to those with either less or more experience.

While the age group approached significance ($\chi^2 = 3.729$, $p = 0.054$), it did not meet the threshold, indicating that age group was not statistically significantly associated with the management of AEFI.

Other factors, such as gender and religion, did not show statistically significant associations, as their p-values were greater than 0.05. Consequently, we reject the null hypothesis for cadre and years of experience, confirming that these factors significantly influence the management of AEFI among health workers.

Table 8: Aassociation between health workers' knowledge and their management of AEFI of Covid-19 vaccines.

Knowledge	Good Management N (%)	Poor Managment N (%)	Chi-square Value	p-value
Poor Knowledge	16 (45.7)	19 (54.3)	6.210	0.013
Good Knowledge	57 (70.4)	24 (29.6)		

The analysis of the association between knowledge and the management of Adverse Events Following Immunization (AEFI) of Covid-19 vaccines revealed a statistically significant finding. Specifically, there was a significant association between knowledge and management of AEFI ($\chi^2 = 6.210$, $p = 0.013$). Health workers with good knowledge were significantly more likely to demonstrate good management practices compared to those with poor knowledge. Consequently, we reject the null hypothesis, confirming that there is a significant association between knowledge and the management of AEFI among health workers (Table 4.8

4.0 DISCUSSION

Findings from this study show that 74.1% of the respondents have heard of AEFI, and 64.7% affirm that AEFI means Adverse Events Following Immunization. This implies a high level of knowledge of the meaning of AEFI among respondents, which is consistent with the findings of Peter et al, (2019) among nurses in Ghana, where 83.4% correctly defined AEFI.This demonstrates a strong foundational awareness among healthcare professionals, which is crucial for effective vaccine administration and monitorin

Additionally, the findings revealed that 51.7% of the respondents affirm that AEFI can result from a wrong injection procedure, 60.3% attest that AEFI can be caused by a low potency vaccine, and 48.3% agreed that AEFI can occur coincidentally after vaccination. Moreover, 51.7% of the respondents reported that AEFI are associated with fever, pain, and swelling at the injection site, aligning with Tolulope et al. (2012), who reported similar symptoms among their study participants.This suggests that the respondents have a well-rounded understanding of the multifaceted nature of AEFI, which is essential for accurate diagnosis and response.

Furthermore, the study shows that 47.4% of the respondents indicated they would not take the second dose of the Covid-19 vaccine, possibly due to their own or others' experiences with AEFI from the first dose. Additionally, 51.7% of the respondents believe there is no need to report AEFI post Covid-19 vaccination. This study also revealed that 43.1% of the respondents encourage their friends and family to take the Covid-19 vaccine despite their AEFI experiences, while 38.7% believe that AEFI from the Covid-19 vaccine are similar to those from other vaccines. These findings suggest a negative attitude towards Covid-19 vaccination among the respondents, consistent with a study in May 2020 involving 5000 US participants, which found that only 31.1% did not intend to be vaccinated. Conversely, approximately 45% of second dose recipients received the SP vaccine, known for its minimal side effects (Khubchandani et al., 2021). The reluctance to report AEFI is particularly troubling, as it hinders the ability to monitor and manage vaccine safety effectivelyAdditionally, 47.4% of the respondents believe that the Covid-19 vaccine's AEFI

differ from those of other vaccines, contrasting sharply with a study in Saudi Arabia where 64.7% were willing to take the vaccine regardless of potential side effects (Al-Mohaithef & Padhi, 2020).

Moreover, the study found that 60.3% of the respondents received both doses of the Covid-19 vaccine, and 43.9% reported experiencing AEFI after the first dose. Of those who took both doses, 64.3% received the second dose, and among them, 84.4% experienced some form of AEFI. To manage these effects, 52.5% of the respondents used analgesics, 52.5% used cold compresses, and 56.0% ignored the symptoms of AEFI. The decline in Covid-19 vaccine uptake reflects the negative attitudes towards vaccination among the respondents, despite their effective management of AEFI. This finding is consistent with Oriji et al. (2021), who reported that only 24.6% of their study population indicated willingness to accept the vaccine despite knowledge of Covid-19 vaccine AEFI. This contrasts with other studies, both local and international, reporting willingness to accept Covid-19 vaccines ranging from 54% to 88% (Olomofe et al., 2021).

Furthermore, the study revealed that 51.7% of the respondents experienced fever after taking the vaccine, 47.4% experienced headaches, and 56.0% experienced pain and numbness at the injection site. Additionally, 33.6% of the respondents reported AEFI to appropriate personnel, while 52.5% used analgesics to control AEFI and 52.5% used cold compresses. These findings indicate that respondents managed the AEFI they experienced well, consistent with Oriji et al. (2021), who found that a majority of vaccine recipients managed symptoms such as headache, fever, weakness, redness at the injection site, and pain with cold compresses, analgesics, and by taking a day off work.

Moreover, further findings from the study showed that 85.7% of the respondents experienced fever after taking the vaccine, 92.9% experienced pain and numbness at the injection site, and 57.1% experienced cold, cough, and catarrh. Additionally, 64.6% experienced sleepiness after vaccination, aligning with Tolulope et al. (2021), who reported fever, convulsions, and weakness in limbs among their respondents. More than half (64.8%) of the mothers were aware of the need to report these adverse events following immunization. Similarly, Rodriguez-Coira and Sokolowska (2020) reported that approximately one in five and one in three did not experience side effects after the first and second doses, respectively.

5.0 CONCLUSION

This study examined health workers' knowledge, attitudes, and management practices regarding Adverse Events Following Immunization (AEFI) of Covid-19 vaccines in Ilejemeje. The findings highlight a generally positive level of awareness among respondents, with significant proportions correctly identifying AEFI and having received training on vaccine safety. Despite this, negative attitudes towards AEFI were prevalent, impacting vaccine uptake decisions and advocacy efforts among health workers.

Management of AEFI varied, with a majority demonstrating proactive practices such as reporting adverse events and employing recommended interventions. Sociodemographic factors like gender, years of experience, and age influenced knowledge levels but did not significantly affect attitudes towards AEFI,

5.1 RECOMMENDATIONS

Based on the findings, the following recommendations are thus suggested:

Government should provide an updated policy interventions that address the gaps in reporting and managing AEFI among health workers. Policies could mandate the reporting of all AEFI cases to ensure comprehensive monitoring and improve vaccine safety protocols.

PHC clinics should implement training programs that emphasize the importance of reporting AEFI and provide strategies for effectively managing these events. This training should also address the psychological barriers that contribute to vaccine hesitancy, helping health workers to become advocates for vaccination rather than participants in the hesitancy.

Future research could also investigate the long-term impact of vaccine hesitancy among healthcare professionals on public health outcomes. Additionally, comparative studies between different regions could provide insights into the effectiveness of various interventions aimed at improving vaccine acceptance and AEFI management.

REFERENCES

Aderibigbe S. A, Osagbemi G. K, Bolarinwa O. A (2010). Adverse events following immunization in a Nigerian tertiary health institution. *American Journal of Scientific & Industrial Research* 2010;1:96-499.

Al-Mohaithef M, Padhi B. K (2020). Determinants of COVID-19 vaccine acceptance in Saudi Arabia: a web-based National Survey. *J Multidiscip Healthc*. 2020;13: 1657–63. https://doi.org/10.2147/JMDH.S276771.

Anderson, E. J, Rouphael, N.G.; Widge, A.T.; Jackson, L.A.; Roberts, P.C.; Makhene, M.; Chappell, J.D.; Denison, M.R.; Stevens, L.J.; Pruijssers, A.J.; et al (2020). Safety and Immunogenicity of SARS-CoV-2 mRNA-1273 Vaccine in Older Adults. N. *Engl. J. Med*. 2020, 383, 2427–2438

Center for Disease Control and prevention (CDC) (2021). Available online: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/expect/after.html (accessed on 17 April 2021).

Centers for Disease Control and Prevention [Internet]; Atlanta (GA): CDC (2020); [no date Influenza-Related Questions & Answers by Topic; [updated 28 April 2020; accessed 11 May 2020]. Available at: https://www. cdc.gov/flu/symptoms/symptoms.htm

CIOMS. Practical aspects of signal detection in pharmacovigilance. Report of CIOMS Working Group VIII. 2010. Available from: https://cioms.ch/publications/product/practical-aspects-of-signal-detection-in-pharmacovigilance-report-ofcioms-working-group-viii/. Accessed 21 November 2020.

Elhadi M, Msherghi A, Alkeelani M, Alsuyihili A, Khaled A, Buzreg A, (2020). Concerns for low-resource countries, with under-prepared intensive care units, facing the COVID-19 pandemic. Infect Dis Health. 2020;25(4):227–32. https://doi.org/10.1016/j.idh.2020.05.008.

Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, (2020). Baseline characteristics and outcomes of 1591 patients infected with SARSCoV-2 admitted to ICUs of the Lombardy region, Italy. JAMA. 2020;323(16): 1574–81. https://doi.org/10.1001/jama.2020.5394

Hajj Hussein I, Chams N, Chams S, El Sayegh S, Badran R, Raad M, (2015). Vaccines Through Centuries: Major Cornerstones of Global Health. Front Public Health. 2015; 3:269. https://doi.org/10.3389/ fpubh.2015.00269

Harapan H, Wagner A. L, Yufika A, Winardi W, Anwar S, Gan A. K, Setiawan A. M, Rajamoorthy Y, Sofyan H, Mudatsir M (2020). Acceptance of a COVID-19 Vaccine in Southeast Asia: A Cross-Sectional Study in Indonesia. Frontiers Public Health. 2020;8:381. https://doi.org/10.3389/fpubh.2020.00381.

Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, (2020). Clinical features of patients infected with 2019 Novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497–506.

Irsida Mehmeti, Erida Nelaj, Artan Simaku, Eugena Tomini & Silva Bino (2017) Knowledge, practice and approaches of health professionals to adverse events following immunization and their reporting in Albania

Khubchandani J, Sharma S, Price J. H, Wiblishauser M. J, Sharma M, Webb F. J (2021). COVID-19 vaccination hesitancy in the United States: a rapid national assessment. *J Community Health*. 2021;46(2):270–7. https://doi.org/10.1007/ s10900-020-00958-x

Lawal A. Mohammed, Alhaji A. Aliyu, Bilkisu B. Maiha, Abdulkadir Isa (2021). Knowledge, Perception and Reporting Attitude of Adverse Effects following Immunization among Primary Healthcare Workers in Sabon Gari Local Government Area Zaria, Kaduna State, Nigeria

Lurie N, Saville M, Hatchett R, Halton J (2020). Developing Covid-19 vaccines at pandemic speed. N *Engl J Med*. 2020;382(21):1969–73. https://doi.org/10.1 056/NEJMp2005630.

Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, et al (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*. 2020; 78:185–93. https://doi.org/10.1016/j.ijsu.2020.04.018

Olomofe C.O, Soyemi K. V, Udomah B. F, Owolabi A. O, Ajumuka E.E, Igbokwe M. C, et al (2021). Predictors of uptake of a potential Covid-19 vaccine among Nigerian adults. *J Vaccines Vaccin*. 2021;12(1):442– 445.

Oriji P. C, Allagoa D. O, Obagah L, Tekenah E. S, Ohaeri, O. S, Atemie G, 2021). Perception about Covid-19 vaccine among patients at the Federal Medical Centre, Yenagoa, South-South Nigeria. *Int J Res Med Sci*. 2021;9(5):1281–1287

Peter Yamoah, Varsha Bangalee & Frasia Oosthuizen (2019). Knowledge and Perceptions of Adverse Events Following Immunization among Healthcare Professionals in Africa: A Case Study from Ghana.

Rodriguez-Coira, J.; Sokolowska, M (2020). SARS-CoV-2 candidate vaccines—Composition,

mechanisms of action and stages of clinical development. Allergy 2020.

Tolulope O afolaranmi, Z.I. Hassan, O.Y. Sodipo, D. Gwomson, O.J. Ugwu, A.O.D. Ofakunrin, O.O. Ige, Y. O. Tagurum, P.W. Bupwatda (2021). Knowledge of adverse events following immunization, its prevalence and actions of mothers of children aged 0–23 months in a tertiary health institution in Jos, North Central Nigeria

World Health Organization (2014). Global manual on surveillance of adverse events following immunization. 2014. Available from: https://www.who.int/vaccine_safety/publications/aefi_surveillance/en/. Accessed 21 November 2020. 03

World Health Organization (WHO)(2020). Preguntas y respuestas sobre la enfermedad por coronavirus (COVID-19) [Coronavirus Disease (COVID-19): Questions and Answers]; [accessed 12 May 2020]. Available at: https://www.who.int/es/emergencies/diseases/novel-coronavirus-2019/advice-forpublic/q-a-coronaviruses

World Health Organization(2020). WHO Coronavirus Disease (COVID- 19) Dashboard: retrieved from www. world health organization.org/cvd/ashboard on May 25th 2022.

Zimmer C, Corum J, Wee S-L (2020). Coronavirus vaccine tracker US: The New York Times; 2020 [cited 2020 December 13]. Available from: https://www.nytimes.com/interactive/2020/science/coronavirusvaccine-tracker.html.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

CYBERCRIMES, INTERNET PENETRATION AND BANKING SECTOR PERFORMANCE: EMPIRICAL EVIDENCE FROM NIGERIA

Faruq Umar QUADRI
Innovation and Technology Policy Department (ITPD), Nigerian Institute of Social and Economic Research (NISER)
Corresponding email: qufaruq@gmail.com

ABSTRACT
In this study, the moderating role of cybercrime on the link between internet penetration, and performance in the Nigerian banking sector was investigated. The two key factors that drive the study—cybercrime and banking performance—were sourced from the Nigeria Deposit Insurance Corporation (NDIC), an entity with the responsibility of managing the Deposit Insurance System (DIS) in Nigeria. The range of the data is from 2011Q1 to 2022Q4, and a Two-Stage Least Square (2SLS) techniques was employed to achieve the objectives. The results revealed that internet penetration has a positive and significant impact on banking performance in Nigeria.That is, it shows that a 1% increase in internet penetration in Nigeria leads to approximately 0.42 percent increase in return on assets. And that a 1% increase in cybercrime damps the relations between internet penetration and ROA by 0.22%. This implies that cybercrime negatively influences the nexus of internet penetration-banking performance in Nigeria. Thus, our study recommends that as cybercrime has become an unintended consequence of internet penetrations, the operators in banking industry in Nigeria particularly, to prevent any type of compromise, the Deposit Money Banks (DMB) and Central Bank of Nigeria (CBN) must implement strict corporate rules that guarantee proper protection of customer data. Also, proper approval protocols for the entire banking system/operation are required, with at least two permission needs for wire transfers or clearance transfers among other things. This must be done in coordination with the Nigeria Deposit Insurance Commission (NDIC) and the CBN.

Keywords: *Cybercrimes, Internet penetration, Banking Performance, Two-SLS, and NDIC*

1.0 INTRODUCTION
The last two decades have brought about a tremendous change in the way banking services are provided due to the quick growth of technologies. The banking business is fast innovating across the board, from analogue banking to digital currency to blockchain applications (Lucey et al., 2018). In Nigeria, internet banking has grown quickly in recent years, just like it has in many other economies of the world. Initially, investment bankers were those predominantly made use of internet service in banking system but currently, however, a notable trend is the gradual acceptance of internet penetration by commercial banks and other non-banking financial operators, in the provision of services to the financial industry (Cummins et al., 2020).

Even with all the economic advantages that came with internet usage in the banking industry, it also has unanticipated negative impacts on the efficiency of the industry due to illicit activities like credit card fraud (Victor and Oluwatosin, 2010). Cybercrimes are computer-related offenses committed for profits/gains, including identity theft and other offenses involving computer contents that are difficult to define legally as a whole. Fraud is said to occur when an individual or organization in an official capacity with obligations willfully defies the law for their own or their company's gain at the cost of everyone else. It is a global ailment that impacts all institutions and economic systems. Contrarily, bank fraud is the use of questionable practices to gain access to assets held by or belonging to financial institutions (Nwaeze, 2008). The financial system, and banks in particular, are seriously threatened by the rising tide of widespread fraud in recent years in credit intermediaries (Usman & Shah, 2013). Additionally, the prevalence of frauds and forgeries may, in rare circumstances, result in the shutdown of banks (Fatoki, 2015). Internal frauds and credit abuses which were greatly facilitated by the internet penetration is singled out as the cause of many distressed banks in Nigeria (Nwaeze, 2008). In its 2020 annual report for the industry, the NDIC reported that the quantum of fraud cases increased significantly from 52,754 in 2019 to 146,183 in 2020, representing a 177.10% rise. However, the total sum of monetary value involved in 2020 was N120.79 billion as against N204.65 billion in 2019, a decrease of 40.98%. The overall actual loss also decreased somewhat from N5.46 billion in 2019 to N5.33 billion in 2020 (NDIC, 2020). Regrettably, the channels and tools used to carry out these banking frauds and forgeries have gradually changed from traditional to internet/digital channels including ATM cards, mobile banking, and web-based. For instance, fraud involving ATM cards was the most prevalent, equals to 39.81% of all fraud cases, trailed by fraud involving mobile banking

at 17.35% (NDIC, 2020). According to Adebisi (2009), the financial institutions face significant obstacles to their survival and viability due to the rise in fraud incidents and the comparatively huge amounts involved. It is thus imperative that the widespread of fraud, including cyber fraud, in Nigeria's banking sector is given a deserved attention.

Concern over cybersecurity and other fraudulent activities in the banking industry is still quite high in Nigeria, despite the regulations putting in place by the highest bank in the land, the Central Bank of Nigeria (CBN), in conjunction with the roles of the NDIC in the banking cyberspace. This deep concern seems to be indirectly moderating the impact of internet penetration on the industry's performance in Nigeria. According to the NDIC's 2018 report on examinations and special investigations, the banking industry is still battling with a number of challenges, which include cybercrime. Accordingly, fraudulent practices via the Internet and automated teller machines (ATMs) remain one of the elements that has the biggest impact on the performance of the Nigerian banking sector (Akinyomi, 2012; Okpara, 2009). It is thus apparent that the advantage of internet penetration on the performance of Nigeria's banking sector is coming along with unanticipated effects of cybercrimes.

In spite of financial resources that are currently allocated to government agencies such as the Economic and Financial Crimes Commission (EFCC), the Nigerian Police, and other agencies upholding law in Nigeria to combat this menace, their efforts have not yielded a substantial result. They have not successfully tamed or significantly reduced the rate at which this plague ravages the Nigerian economy. For instance, in order to have any real influence on containing this plague, it is predicted by Gartner (2019) that global investment on information security would need to considerably increase to $124 billion. Yet, according to some security researchers, spending on cybercrime will outstrip investment on cyber-security by nearly 16 times by the end of 2019, when it is projected that expenditures will have quadrupled from their 2015 number to about $2.1 trillion (Fadairo-Cokers and Ibrahim, 2021). This thus implies that for these agencies to have any meaningful impact in the war against cybercrime, there is need for increase in budgetary allocation to these agencies in a bid acquire cutting-edge smart technologies to tackle this challenge. This consequently, constitutes another drain on the lean revenue of the government at all levels.

Therefore, the study's objective is to look at the moderating role of cybercrime on the nexus between internet penetration and performance of banking industry in Nigeria. Specifically, to examine the effect of internet penetration on baking performance in Nigeria. And to determine the moderating role of cybercrimes on the nexus between internet penetration and banking performance in Nigeria.

Trends of Cybercrime, and Internet Penetration in Nigeria: 2011-2021

In Figure 1, the trends of cybercrime, and internet penetration in Nigeria from 2011 to 2021 is considered. It can be seen from the Figure that as the internet subscription per 1000 inhabitants increases, cybercrime increases in the following year. For instance, in 2011, when intent sub was at its lowest value of 0.008 per 1000, cybercrime recorded was value at ₦ 0.12 billion. This increased to ₦ 0.79 billion in 2012 when internet sub was around 0.01 per 1000. In 2017, at the highest internet sub of 0.06 internet sub per 1000, the highest value of cybercrime of ₦ 6.49 billion was recorded. In summary, the trend of cybercrime seems to be proportional to the trend on internet penetration with some lags.

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

The blend of Technology-Enabled Crime theory and theory of Structure-Conduct-Performance (SCP) are adopted as theoretical framework to drive the study. For the purpose of assisting society in better understanding how criminal behavior changed in tandem with computer and communications technology, the theory of technology-enabled crime is made up of numerous kinds of criminological theories. According to McQuade (1998), it is difficult to understand and manage more complex criminality at first. There is also an ongoing technological arms race between criminal organizations and law enforcement organizations. Criminal conduct must be monitored by law enforcement as it changes and becomes more inventive to avoid, manage, prevent, and stop new kinds of crime.

According to the SCP model, market structure has an impact on bank conduct, which has an impact on performance. Banks are more likely to act in a quid pro quo manner in a highly concentrated market, and their oligopoly rents enhance profitability. In this instance, market concentration is used to infer behavior, which is an unobservable. We may utilize our fundamental profit model to generate the SCP relationship even though the SCP hypothesis lacks a formal foundation.

2.2 Empirical Literature

The traditional operations of commercial banks are being impacted by the increased competition caused by internet penetration in China's financial services sector (Funk, 2019). Also, it might have an effect on the financial operation and the industry operating framework (Gonzalez & Loureiro, 2014). On the flip side, it is undeniable that the growth of the Internet has given commercial banks the push and chance to reform. The growth of the Internet has benefited commercial banks since it has compelled established banks to modernize their framework and boost their comprehensive organizational performance (DeYoung et al., 2007).

Mobile phone usage exhibits a favorable effect on economic performance, claim Andrianaivo & Kpodar (2012). In addition, there is a favorable and strong correlation between internet penetration rates and financial inclusion. Moreover, Mago & Chitokwindo (2014) in Zimbabwe found that mobile banking has been popular among the country's poor since it is simple to use, quick, affordable, and secure. In similar research, Kpodar & Andrianaivo (2011) find that the introduction of internet devices substantially accelerates the expansion of this sector in Africa since it promotes financial inclusion.

Moreover, Oyewole, et al., (2013) revealed that electronic banking has been of immense benefits to the growth of banking in Nigeria in terms of return on assets (ROA) and net interest margin (NIM), but not return on equity (ROE).

We can conclude that the bunch of current research reviewed suggest that internet penetration ultimately leads to increased tremendously the industry's performance in Nigeria.

Between the years of 1994 and 2015, Funso & Olaniyan (2018) examined how fraud affected the operation of Nigerian deposit money institutions. According to this study, the deposit of banks in Nigeria are negatively and significantly impacted by the quantities of cases of fraud, the loss of funds due to fraud, and the volume of staff members participated. The study's results, which were obtained using ordinary least squares regression methods, demonstrated that fraud showed a detrimental influence on the money market in Nigeria. The influence of bank cyber fraud on the expansion of Nigerian financial market was explored by Iyodo, et al., 2016. They find that the development of the industry in Nigeria is negatively and remarkably impacted by banking frauds.

The proliferation of the internet has made banking procedures more complex; this has altered how bank fraud is perpetrated and other illicit activities. The volume of internet banking transactions has increased, according to Berney (2008), as more and more customers rely on the internet for their financial requirements. Cybercriminals can target the clients of banks who are only available virtually to confirm their online banking transactions, according to Gates and Jacob (2009) and Malphrus (2009).

3.0 RESEARCH METHODOLOGY

3.1 Data Sources and Description

Two sources were used to gather the data: the Nigeria Deposit Insurance Corporation (NDIC) and the World Bank (WDI). The Deposit Insurance System (DIS) in Nigeria is managed by the NDIC, a statutory organization created by NDIC Act No. 16 of 2006. The NDIC has w a deposit-taking institution is given a license as part of the configuration of the country's need One of such aspects is to safeguard customers and ensure the fulfillment of secured funds. The World Bank's data is used for the remaining variables, while the NDIC's data on cybercrime and banking industry performance serves as the study's main driving force (WDI, 2022).

The data are of quarterly frequency ranging from 2011Q1 to 2022Q4 as extracted from various sources. These series are originally annual data but due to limitations of some of the series, we will quarterize them. Many benchmarking and quarterlization procedures are used, according to Bloem et al. (2001). In order to interpolate annual flow times data, the study uses the Proportional Denton Method, which is advised by the International Monetary Fund and the World Bank (IMF) (Osuji, 2013).

Table 1 presents information about the series employed in the paper for our estimation. These consist of our dependent variables of banking sector performance which will be measured by ROA and ROE, and the control variables that include internet penetration (Int_Pen), youth unemployment (Yun), real gross domestic product per capita (RGDPPC), and Human Capital Development (HCD).

Table 1: Data Sources and Description

Variables	Acronyms	Measurement	Source
Banking Sector Performance	Bank_Perf	Return on Asset (ROA) and Return on Equity (ROE)	Nigerian Deposits Insurance Corporation (NDIC)
Cybercrimes	CCRIME	Contribution of Cybercrime to Total Fraud in Nigeria (N' Billion)	Nigerian Deposits Insurance Corporation (NDIC)
Internet Penetration	ICTs	Fixed Internet suscriptions per 100 inhabitants	World Development Indicators (WDI) 2022
Economic Performance	RGDP	Real Domestic Growth Product	World Development Indicators (WDI) 2022
Youth Unemployment Rate	Yun	% of total labor force ages 15-24	World Development Indicators (WDI) 2022
Poverty level	RGDPPC	Per capita income	World Development Indicators (WDI) 2022
Human Capital Development Index	HCD	Secondary School enrolment	Penn 10.1

Source: Compiled by the Author.

3.2 Analytical Framework

A foundational model of a bank that maximizes performance (profit) is developed in this section. Without sacrificing generalization, no fixed costs are assumed at all, and that all inputs are perfect complements with no cross-price elasticity (in the long run).

Each bank I aims to maximize its earnings with the aid of the transformation function T and the pricing possibility set H. These factors show how a bank is perceived in terms of its level of competition and its clients' capacity to pay the rates it sets. The price opportunity setter includes Z, the level of equity.

For every output in the output vector Yi (Y), each bank is required to estimate the price p using the opposite demand function. Then, bank i maximizes:

$$\prod_i = \rho Y_i - w_i X_i$$

Subject to;

$$T(X_i, Y_i) = 0$$

$$H(\rho, Y_i, w_i, Z_i) = 0$$

$$\rho = f(\sum_{j=1}^{N} Y_i) = f(Y)$$

where N represents volume of firms in banking industry in the economy and f (Y) is inverse market demand. The related Lagrangian system is denoted by:

$$L = \rho Y_i - w_i X_i - \xi T(\bullet) - \theta H(\bullet) \quad (1)$$

The ideal input and output amounts and prices are obtained by simultaneously solving for p and X (denoted by asterisks):

$$\rho^* = \rho(Y_i, w_i, Z_i)$$
$$X^* = X_i^*(Y_i, w_i, Z_i)$$

Profits are maximized if,

$$\frac{d\prod_i^*}{dY_i} = \rho^* + Y_i f'(Y)\frac{dY}{dY_i} - w_i \frac{dX_i^*}{dY_i} = 0 \quad (2)$$

where the demand for outputs Yi determines the ideal number of inputs X i*. Yi multiplied by results in:

$$\rho^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i = -(Y_i)^2 f'(Y)(\frac{dY}{dY_i}) \quad (3)$$

where "Y i" stands for revenue. In this case, banks are supposed to conduct business in output markets characterized by price-segmentation, albeit facing perfectly competitive input markets. As a result, by altering the costs and prices of their output pricing schemes, banks can compete in response to changing characteristics of the market. Output numbers, input costs, and other factors that are all presented at the time of price setting decide how much of an impact they can have on pricing. We can overlook output prices in the empirical analysis even when not needed in the analytical framework, they are vulnerable to significant measurement mistakes.

We also alter and rearrange equation 3 to produce a model that is better consistent and in tandem with reality. We start by defining I as follows:

$$\frac{dY}{dY_i} = 1 + \frac{d\sum_{j\neq i} Y_j}{dY_i} = 1 + \lambda_i$$

(4)

where λi is the output-related hypothetical dispersion for firm i. Equation 3's result after substituting λi is:

$$\rho^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i = -(Y_i)^2 f'(Y)(1 + \lambda_i)$$

(5)

$$\frac{\rho^* Y_i - w_i \frac{dX_i^*}{dY_i} Y}{\rho^* Y_i} = -\frac{Y_i}{Y}\frac{f'(Y)Y}{\rho^*}(1 + \lambda_i)$$

(6)

Even though the SCP hypothesis is devoid of a theoretical basis, nevertheless, we may be able to produce the SCP relationship using our basic profit model. We first get our core framework by multiplying Equation 4.5 by the number of enterprises:

$$\rho^* Y - \sum_{i=1}^{N} w_i \frac{dX_i^*}{dY_i} Y = -\sum_{i=1}^{N} \left(\frac{Y_i}{Y}\right)^2 (f'(Y)Y^2)(1 + \frac{\sum \lambda_i Y_i}{\sum Y_i^2})$$

(7)

Dividing both sides by gives:

$$\prod^* = \rho^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i = -\left((HHI)\left(\frac{1}{\eta}\right)(1 + \mu)\right)$$

(8)

Where the Herfindahl–Hirschman Index, HHI $= \sum_{i=1}^{N} \left(\frac{Y_i}{Y}\right)^2$ (, $\left(\frac{1}{\eta}\right) = f'(Y)Y^2)$/p∗Y and $\mu = \frac{\sum \lambda_i Y_i}{\sum Y_i^2}$

Altogether, we have demonstrated a fundamental connection between performance and structure that, if we assume and that it is a constant function of HHI, then the SCP relationship holds true. As a result, the fundamental equation becomes:

$$\prod^* = ((HHI)(1 + \lambda))\rho^* Y_i \qquad (9)$$

Interpreting the joint effect of λ and HHI on banks' efficiency is what the model essentially does.

3.3 Analytical Technique and Empirical Model

To achieve the objective of this study that examines the impact of internet penetration on banking sector performance which is indicated by two proxies: return on assets (RoA) and return on equity (ROE) (RoE) as defined in Table 1., was achieved employing the Two-stage Least Square (2SLS). The potential endogeneity/simultaneity that may stem from the reverse causality between CCRIME and IINT_PEN is addressed using instrumental variable procedure in the following reduced form equations:

$$CCRIME_t = \sum_{i=1}^{m} \alpha_i CCRIME_{t-1} + \sum_{i=0}^{n} \beta_i x_{t-1} + e_t$$

(10)

$$ln\, B\, ank_Per = \alpha_0 + \alpha_1\, ln\, C\, CRIME_t + \alpha_2\, ln\, R\, GDP_t + \alpha_3\, ln\, Y\, UN + \varepsilon_t \qquad (11)$$

Where, Bank_Per denotes bank performance capture with ROA and ROE, Int_Pen is the Fixed Internet suscriptions per 100 inhabitants, captures economic growth in Nigeria, is the Human Capital Development Index.

Finally, equation (12) incorporates the conditional implications and provides a sophisticated approach for modeling the moderating influence of cybercrimes on the link between internet usage and the performance of Nigeria's banking system. By include the multiplication of the cybercrime and internet penetration variables as one of the explanatory variables in the equation, the conditional effect is captured.

$$ln\, B\, ank_Per = \alpha_0 + \alpha_1\, ln\, \overline{CCRIME_t} + \alpha_2\, ln\, R\, GDP_t + \alpha_3\alpha_3\, ln\, Y\, UN + \varepsilon_t$$

(12)

where Cybercrime denotes Ccrime to total fraud in Nigeria; is the interactive term of internet penetration and cybercrime; and all other factors are still as they were before. By considering partial derivatives of equation (12), one may derive the total impact of internet penetration, which also accounts for the marginal impact of cybercrime on banking sector performance:

$$\frac{\partial Bank_Per_t}{\partial Int_Per_t} = \alpha_1 + \alpha_3 Ccrime_t$$

(13)

This should be interpreted in terms of both sign and magnitude. Regarding sign, if > 0 and < 0, cybercrime dampens the impact of internet penetration on banking performance. However, if < 0 and > 0, it reflects that cybercrime ameliorates the impact of internet penetration on banking performance. Meanwhile, if > 0 and > 0, then cybercrime scale-up the impact of internet penetration on banking performance. Lastly, if < 0 and < 0, then cybercrime and internet penetration jointly scale-down banking performance in Nigeria. In terms of magnitude, if > 0, internet penetration and cybercrime positive influence banking performance but if < 0, both internet

penetration and cybercrime negatively influence banking performance in Nigeria.

4.0 RESULTS AND DISCUSSIONS

4.1 Data and Preliminary Analyses

4.1.1 Descriptive Statistics

Table 2 displays the descriptive statistics for these variables. The table shows that CCRIME on average within this period is ₦ 2.28 billion. The maximum CCRIME for the country was ₦ 7.2 billion and the minimum of ₦ 0.004 billion which was recorded in 2018q3 and 2011q1. The average HCD in the period was 0.503 with the maximum HCD of 0.61 over this period recorded in 2015q1, and its minimum of 0.42 was recorded in 2014q2. The average INT_PEN rate over the period is 0.033 per 1000 head with a maximum of 0.075 and minimum of 0.002 per 1000 head in quarters 2011q1 and 2012q4 respectively. Also, the average RGDP in the period under consideration was US$472 billion while US$398 billion and US$517 billion were maximum and minimum values respectively. Furthermore, we observe the Nigerian banking performance using ROA and ROE. On the average, the ROA was 1.94 per cent with its largest value of 2.96 percent and minimum of 0.17 percent in 2012q4 and 2011q3 respectively. The ROE was on the average 18.09 per cent with its largest value of 26.80 percent and minimum of 0.82 percent in 2018q4 and 2011q3 respectively. Lastly, the YUN rate was an average of 13.35 percent at maximum value of 19.94 percent and minimum of 7.53 percent in 2020q4 and 2015q1 respectively.

Table 2: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Skew.	Kurt.	JB-Statistic
CCRIME	44	2.284	1.91	-.004	7.219	.969	3.11	6.640
HCD	44	.503	.041	.422	.608	.534	3.373	3.600
INT PEN	44	.033	.022	0.002	.075	.107	1.993	4.650
RGDP	44	4.720e+11	3.430e+10	3.980e+11	5.170e+11	-.962	2.692	6.320
ROA	44	1.943	.752	.167	2.958	-1.232	3.351	9.260
ROE	44	18.093	7.56	.817	26.804	-.99	2.677	6.570
YUN	44	13.348	4.286	7.529	19.939	.265	1.528	21.610

Source: Author's Computation (2023)

The skewness statistic shows that CCRIME, HCD, INT_PEN, and YUN are positively skewed, while RGDP, ROE and ROA are negatively skewed. The kurtosis statistic shows that the INT_PEN, RGDP, ROE and YUN are platykurtic; having kurtosis statistic of less than 3. While the kurtosis of CCRIME, HCD, and ROA is excessive (k>3). The normality hypothesis can be rejected for CCRIME and HCD at the 5% level of significance, indicating that they are not normally distributed. This is revealed by the Jarque-Bera statistic, which combines the skewness and kurtosis statistics to determine the normality of the variable. For the other model variables, the null is accepted at 1% and 10% level of significance, respectively.

By looking at the correlation between the relevant variables, we continue our preliminary investigation. Instead of using the modified variables in the study, the correlation was done on the primary variables. Table 3 displays the correlation's findings. The finding indicates that no two regressors have a perfect (one-to-one) correlation, which suggests that the multicollinearity issue is less likely than previously thought. ROA negatively corelates with YUN minimally other variables. This has no implication for multicollinearity as it is a correlation between a dependent and an independent variable.

Table 3: Matrix of correlations

Variables	CCRIME	HCD	INT_PEN	RGDP	ROA	ROE	YUN
CCRIME	1.000						
HCD	-0.348	1.000					
INT_PEN	-0.216	-0.304	1.000				
RGDP	0.473	0.002	0.033	1.000			
ROA	0.384	0.048	-0.694	0.277	1.000		
ROE	0.486	0.024	-0.647	0.435	0.887	1.000	
YUN	0.239	-0.177	0.403	0.670	-0.003	0.292	1.000

Source: Author's Computation (2023)

4.1. 2 The Unit Root Test Results

Another preliminary analysis was done using the Unit root test. A test for the series' stationarity is the unit root test. This is essential because it is possible for a non-stationary variable to cause a misleading regression when it is regressed on another non-stationary variable. Three common unit root tests—the Augmented Dickey Fuller (ADF), Phillip-Perron (P-P), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) Tests—were used to run the test. In the absence of the unit root null hypothesis, a (level) series is stationary I(0). When the series has been first-differenced and the null hypothesis is rejected, the series is I(1). The results of the test are displayed in Table 4. The test shows that CCRIME, HCD, INT_PEN, RGDP, ROE and YUN are stationary after first difference, I(1), while ROE is stationary at level, I(0). The KPSS and PP values are very consistent with one another. The unit root results imply that a method for cointegrating these variables that is appropriate must take into consideration mixed orders of integration. Therefore, the ARDL bound testing cointegration approach is used in this work.

Table 4: Unit Root Results

	ADF Test			Phillip-Perron Test			KPSS Test		
	Level	First Diff	Remark	Level	First Diff	Remark	Level	First Diff	Remark
CCRIME	-6.12*	-5.17*	H(0)	-2.39	-2.84**	H(1)	0.06	0.042	H(0)
HCD	-9.82*	-5.95*	H(0)	-2.96**	-3.02***	H(1)	0.05	0.03	H(0)
INT_PEN	-5.23*	-4.35*	H(0)	-2.381	-2.35	H(2)	0.11	0.13	H(0)
RGDP	-2.67**	-3.64*	H(0)	-1.95	-2.28*	H(1)	0.23	0.09	H(0)
ROA	-6.94*	-5.08*	H(0)	-2.61***	-3.05**	H(0)	0.08	0.06	H(0)
ROE	-4.93*	-4.27*	H(0)	-2.19	-2.95**	H(1)	0.09	0.07	H(0)
YUN	-1.46	-4.11*	H(1)	-0.13	-2.46	H(1)	0.20	.11	H(0)

Source: Author's Computation (2023)

Note: Following modeling with constant, constant & trend, and with none, the reported unit root results come from the best unit root models. Models having none, constant, and constant & trend are denoted, respectively, by superscripts a, b, and c. Additionally, the unit root null hypothesis is disproved at 1%, 5%, and 10% levels of statistical significance, respectively, as indicated by the asterisks *, **, and ***.

4.3.3: Examining the Impact of Cybercrime on Banking Performance in Nigeria

In making a choice between two estimators of Ordinary Least Square (OLS) and the 2_stage Least Square (2SLS), the Hausman test statistic developed by Hausman in 1978 was employed. Thus, the hypothesis tested is:

H_0 : The efficient estimator (OLS) is consistent Vs

H_1: The efficient estimator (OLS) is inconsistent

We estimated and analyzed the 2SLS estimator since the estimation of the Hausman was determined to be statistically significant at ($p < 0.05$ & $p < 0.1$) and rejected. As a result of its superior performance over the Dynamic OLS estimator, the analysis is based on the 2SLS estimates. The table 5 and 6 depict the findings for the 2SLS estimator as shown below. As was previously mentioned, two empirical models were estimated to proxy banking performance. The dependent variable in the first model is Return on Assets (ROA), while the regressor in the second model is Return on Equity (ROE).

The result depicts the observed relation between banking performance and internet penetration in Nigeria. In the first model, the findings show that there is a positive and statistically significant relationship (P<0.1) between internet penetration and ROA. It shows that a 1% increase in internet penetration in Nigeria leads to approximately 0.42 percent increase in return on assets. In other words, this implies that as the internet penetrates in Nigeria, banking performance in terms of ROA rises. However, in model two, the result shows a non-positive and statistically insignificant relation between internet penetration and banking performance in terms of ROE. This implies that a 1% increase in penetration results in 0.398% decrease in return on equity. We can thus infer that internet penetration has a positive and significant impact in banking sector in Nigeria. This finding corroborates with that of Funk (2019), Gonzalez & Loureiro (2014), and Oyewole, et al., (2013) in China, Spain and Nigeria respectively.

Accordingly, it is unexpectedly found that HCD, when all other factors are held constant, has a negative but statistically nonsignificant impact on ROA while it exhibits a negative and significant impact on ROE at (p<0.10). This suggests that the performance of the banking industry is negatively impacted by HCD. That is human capital does not positively influence efficiency of banking sector in Nigeria. Last, the level of economic activity as measured by RGDP shows a statistically significant and positive impact on ROA and also, on ROAE. This implies that the level of economic activities positively influences banking performance in Nigeria, ceteris paribus.

Examining the goodness of fits of the models, the R-square values are found to be 40 percent and 44 percent respectively. This suggests that, after accounting for the amount of regressors, the models is able to explain around 40 and 44 percent variations in ROA and ROE, respectively. Meanwhile, using Chi-square statistics in the two models, at 1 percent, clearly the Chi-square values are found to be statistically significant. There is therefore no justification for not rejecting the null hypotheses. In conclusion, we may acknowledge that empirical models are suitable for assessing banking performance. As a result, the Chi-square test, which evaluates the estimated regression's overall significance, also evaluates the R-square's significance (Gujarati, 2004).

Table 5: Analysis of the effect of Internet Penetration on banking sector performance

	lnROA		**lnROE**	
	Coef.	**t-value**	**Coef.**	**t-value**
lnINT_PEN	0.421*	4.25	-0.398	-3.84
lnRGDP	4.38*	3.66	5,657*	4.53
lnHCD	-2.504	-2.18	-1.983***	-1.65
Constant	-120.57*	32.38	-152.23*	-4.51
	Diagnostics		Diagnostics	
R-squared	0.398		0.447	
Chi-square	24.457		27.371	
Prob > chi2	0.000		0.000	

Source: Author's Computation (2023)

Table 6 depicts the results of moderating role of cybercrimes on relation between banking performance and internet penetration in Nigeria. In the first model, the findings show that cybercrimes negatively and significantly (P<0.1) moderate the impact of internet penetration on ROA. It shows that a 1% increase in cybercrime damps the relations between internet penetration and ROA by 0.22%. In other words, this

implies that cybercrime negatively affects the nexus between internet penetrates and ROA in the sector. Similarly, in model 2, the findings show that cybercrimes negatively and significantly (P<0.1) moderate the impact of internet penetration on ROE. It shows that a 1% increase in cybercrime damps the relations between internet penetration and ROE by 0.26%. In other words, this implies that cybercrime negatively affects the nexus between internet penetrates and ROE in the sector. We can thus infer that cybercrimes negatively and significantly influence the impact of internet penetration on the performance of banking sector in Nigeria. This finding was supported by Funso & Olaniyan (2018), and Iyodo, Agbaji, & Abu (2016) in Nigeria.

Examining the goodness of fits of the models, using Chi-square statistics in the two models, at 1 percent, clearly the Chi-square values are found to be statistically significant. There is therefore no justification for not rejecting the null hypotheses. In conclusion, we may acknowledge that empirical models are suitable for assessing the moderating role of cybercrime on the nexus between internet penetration and banking performance in Nigeria. As a result, the Chi-square test, which evaluates the estimated regression's overall significance, also evaluates the R-square's significance (Gujarati, 2004).

Table 6: Analysis of the effect of Internet Penetration on banking sector performance

	lnROA	
	Coef.	**t-value**
lnINT_PEN	0.347	1.57
lnRGDP	-4.438	-1.51
lnHCD	4.508	1.9
LINT_PEN_CCRIME	-0.217***	-3.25
Constant	123.87	1.53
	Diagnostics	
R-squared	0.074	
Chi-square	20.89	
Prob > chi2	0	

Source: Author's Computation (2023)

5.0 CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Conclusion

In this study, we investigated the cybercrime, internet penetration and performance of banking industry in Nigeria. This was done by examined the impact of cybercrimes on the nexus between internet penetration and banking industry performance in Nigeria.

We chose between using the Ordinary Least Square (OLS) and the Two-Stage Least Square (2SLS) estimators to analyze the effect of cybercrime on Nigerian banking performance. The Hausman test statistic, which Hausman invented in 1978, was used. We estimated and analyzed the 2SLS estimator since the estimation of the Hausman was determined to be statistically significant at (p<0.05 & p<0.1) and rejected. The findings from the analysis of the variables influencing banking performance in Nigeria revealed a positive and significant influence of internet penetration, and level of economic activities while human capital shows no significant impacts. In other words, this implies that as the internet penetration increases in Nigeria, banking sector performance increases, all things being equal. However, our findings reveal that cybercrime plays a negative moderating role on the nexus between internet penetration and banking performance.

5.2 Policy Recommendations

In the light of the foregoing conclusion, the following consequences for policy are suggested:

i. We recommend that the Central Bank of Nigeria (CBN) mandate the players in the industry particularly the deposit money banks (DMB) to dedicate about 0.1% of their net profit/gross profit towards the fight against cybercrime in Nigeria. This is to improve the shortage of finances already confronting the Nigeria's law enforcement agencies.

ii. We recommend that appropriate approval protocols must be implemented throughout the entire banking system and operation in coordination with the Nigeria Deposit Insurance Commission (NDIC) and the Central Bank of Nigeria (CBN), with at least two approval requirements for wire transfers or clearance transfers and others.

iii. There is also a need for the government at all levels in Nigeria, to deal ruthlessly with the socio-economic menace of youth unemployment and poverty which is the basic reason for the youth involvement in crimes in general, in Nigeria.

REFERENCES

Abdulkadir, D. S., Isiaka, S. B., & Adedoyin, S. I. (2012). Effects of strategic performance appraisal, career planning and employee participation on organizational commitment: An empirical study. *International Business Research*, *5*(4), 124.

Adegbola, I., & Fadara, O. (2022). Cyber Crime among

Mathematical Science Students: Implications on their Academic Performance. *JOURNAL OF DIGITAL LEARNING AND DISTANCE EDUCATION*, *1*(2), 47-54.

Adesina, O. S. (2017). Cybercrime and poverty in Nigeria. *Canadian social science*, *13*(4), 19-29.

Adomi, E. E., & Igun, S. E. (2008). Combating cybercrime in Nigeria. *The Electronic Library*.

Aduda, J., & Kingoo, N. (2012). The relationship between electronic banking and financial performance among commercial banks in Kenya. *Journal of finance and investment analysis*, *1*(3), 99-118.

Akinyomi, O. J. (2012). Examination of fraud in the Nigerian banking sector and its prevention. *Asian Journal of Management Research*, *3*(1), 182-194.

Andresen, M. A. (2013). Unemployment, business cycles, crime, and the Canadian provinces. *Journal of Criminal Justice*, *41*(4), 220-227.

Andrianaivo, M., & Kpodar, K. (2012). Mobile phones, financial inclusion, and growth. *Review of Economics and Institutions*, *3*(2), 30.

Atrill, P., & McLaney, E. J. (2006). *Accounting and Finance for Non-specialists*. Pearson Education.

Avizienis, A., Laprie, J. C., Randell, B., & Landwehr, C. (2004). Basic concepts and taxonomy of dependable and secure computing. *IEEE transactions on dependable and secure computing*, *1*(1), 11-33.

Campbell, H. (2014). Religion and the Internet in the Israeli Orthodox context. In *New Media, Politics and Society in Israel* (pp. 58-77). Routledge.

Chittenden, F., Hall, G., & Hutchinson, P. (1996). Small firm growth, access to capital markets and financial structure: Review of issues and an empirical investigation. *Small business economics*, 59-67.

Clough, J. (2012). The Council of Europe Convention on cybercrime: defining crime in a digital world. In *Criminal Law Forum* (Vol. 23, No. 4, pp. 363-391). Springer Netherlands.

Dasgupta, S., Laplante, B., Wang, H., & Wheeler, D. (2002). Confronting the environmental Kuznets curve. *Journal of economic perspectives*, *16*(1), 147-168.

de Coning, E., & Stølsvik, G. (2013). United Nations Office on Drugs and Crime. *The International Journal of Marine and Coastal Law*, *28*(1), 189-204.

DeYoung, R., Lang, W. W., & Nolle, D. L. (2007). How the Internet affects output and performance at community banks. *Journal of Banking & Finance*, *31*(4), 1033-1060.

Dimitrov, V., & Jain, P. C. (2008). The value-relevance of changes in financial leverage beyond growth in assets and GAAP earnings. *Journal of Accounting, Auditing & Finance*, *23*(2), 191-222.

Drigă, I., & Socol, A. (2009). Liquidity risk management in banking. *Revista tinerilor economişti*, *13*, 46-55.

Ellison, L., & Akdeniz, Y. (1998). Cyber-stalking: the Regulation of Harassment on the Internet. *Criminal Law Review*, *29*, 29-48.

Fatoki, O. (2015). The causes and consequences of household over-indebtedness in South Africa. *Journal of social sciences*, *43*(2), 97-103.

Finklea, K. M., & Theohary, C. A. (2015, January). Cybercrime: conceptual issues for congress and US law enforcement. Washington: Congressional Research Service, Library of Congress.

GAMBO, I., OLUWAGBEMI, O., & ACHIMUGU, P. (2011). Lack of interoperable health information systems in developing countries: an impact analysis. *Journal of Health Informatics in Developing Countries*, *5*(1).

Gonzalez, L., & Loureiro, Y. K. (2014). When can a photo increase credit? The impact of lender and borrower profiles on online peer-to-peer loans. *Journal of Behavioral and Experimental Finance*, *2*, 44-58.

Goulas, E., & Zervoyianni, A. (2012). *Growth, Deficits and Uncertainty in a Panel of 28 Countries* (No. 52_12).

Hale, C., & Sabbagh, D. (1991). Testing the relationship between unemployment and crime: A methodological comment and empirical analysis using time series data from England and Wales. *Journal of Research in Crime and Delinquency*, *28*(4), 400-417.

Hamada, R. S. (1972). The effect of the firm's capital structure on the systematic risk of common stocks. *The journal of finance*, *27*(2), 435-452.

Ibikunle, F. and Eweniyi, O. 2013. Approach To Cyber Security Issues in Nigeria: Challenges and Solution. International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE), 1(1), 100–110. Retrieved from http://ijcrsee.com/index.php/ijcrsee/article/view/11/114

Iyodo, B. Y., Agbaji, J. S., & Abu, A. S. (2016). Consequences of bank frauds on the growth of Nigerian economy. *Global Journal of Commerce and Management Perspective*, *5*(4), 19-28.

Janko, Z., & Popli, G. (2015). Examining the link between crime and unemployment: A time-series analysis for Canada. *Applied Economics*, *47*(37), 4007-4019.

Kolapo, F. T., & Olaniyan, T. O. (2018). The impact of fraud on the performance of deposit money banks in Nigeria. *International Journal of Innovative Finance and Economics Research*, *1*(6), 40-49.

Koops, B.J., 2010. The Internet and its Opportunities for Crime. In: Herzog-Evans, M., (ed.) Transnational Criminology Manual. Nijmegen, Netherlands: WLP, pp.735-754.

Lin, M. J. (2008). Does unemployment increase crime? Evidence from US data 1974–2000. *Journal of Human resources*, *43*(2), 413-436.

Loader, B. D., & Thomas, D. (Eds.). (2013). *Cybercrime: Security and surveillance in the information age*. Routledge.

Longe, O., Ngwa, O., Wada, F., Mbarika, V., & Kvasny, L. (2009). Criminal uses of information & communication technologies in sub-Saharan Africa: trends, concerns and perspectives. *Journal of Information Technology Impact*, *9*(3), 155-172.

Mago, S., & Chitokwindo, S. (2014). The impact of mobile banking on financial inclusion in Zimbabwe: A case for Masvingo Province. *Mediterranean Journal of Social Sciences*, *5*(9), 221.

Muradoglu, Y. G., & Baturevich, B. (2010). Would you follow MM or a Profitable Trading Strategy?. *Frontiers in Finance and Economics*, *7*(2), 69-89.

Nwaeze, C. (2008). Quality and internal control challenges in contemporary Nigeria banking. *Zenith Economic Quarterly, Zenith Bank PLC*, *3*(2), 23-28.

Ogbuji, C. N., Onuoha, C. B., & Izogo, E. E. (2012). Analysis of the negative effects of the automated teller machine (ATM) as a channel for delivering banking services in Nigeria. *International Journal of Business and Management*, *7*(7), 180.

Okpara, G. C. (2009). A synthesis of the critical factors affecting performance of the Nigerian banking system. *European Journal of Economics, Finance and Administrative Sciences*, *17*(17), 34-44.

Olubukola Stella Adesina (2017). Cybercrime and Poverty in Nigeria Canadian Social Science Vol. 13, No. 4, 2017, pp. 19-29.

Olumide, O. O., & Victor, F. B. (2010). E-crime in Nigeria: Trends, tricks, and treatment. *The Pacific Journal of Science and Technology*, *11*(1), 343-355.

Olumide, O. O., Victor, F. B. (2010): E-Crime in Nigeria: Trends, Tricks, and Treatment. The Pacific Journal of Science and Technology, Volume 11. Number 1. May 2010 (Spring)

Oluwatolani, O., Joshua, A., & Philip, A. (2011). The impact of Information Technology in Nigeria's banking industry. *arXiv preprint arXiv:1108.1153*.

Oyewole, O. S., Gambo, J., Abba, M., & Onuh, M. E. (2013). Electronic payment system and economic growth: a review of transition to cashless economy in Nigeria. *International Journal of Scientific Engineering and Technology*, *2*(9), 913-918.

Ozeh, C. C., & Ohajionu, C. C. (2019). Unemployment, Migration and Cyber Criminality in Nigeria. *Internal Security Management in Nigeria: Perspectives, Challenges and Lessons*, 165-180.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.

Raphael, S., & Winter-Ebmer, R. (2001). Identifying the effect of unemployment on crime. *The journal of law and economics*, *44*(1), 259-283.

Ribadu, N. (2007). Cyber-crime and commercial fraud: A Nigerian perspective. Presented at the Congress Celebrating the Fortieth Annual Session of the UNCITRAL (United Nations Commission On International Trade Law), Vienna, Austria, 9-12 July. Retrieved from http://www.cnudmi.org/pdf/english/congress/Ribadu_Ibrahim.pdf

Safeena, R., Date, H., & Kammani, A. (2011). Internet Banking Adoption in an Emerging Economy: Indian Consumer's Perspective. *Int. Arab. J. e Technol.*, *2*(1), 56-64.

Sreedevi, V., & Meena, K. (2011). ICT and financial inclusion. *International Journal of BusinessManagement, Economics and Information Technology*, *3*(2), 331-334.

Srivastava, S. (2014). Entangled urbanism: Slum, gated community, and shopping mall in Delhi and Gurgaon.

Yar, M. (2005). The Novelty of 'Cybercrime' An Assessment in Light of Routine Activity Theory. *European Journal of Criminology*, *2*(4), 407-427.

Yar, M., 2005. The novelty of 'cybercrime': An assessment in light of routine activity theory. European Journal of Criminology, 2(4):407- 427.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ASSESSMENT OF THE GROWTH PERFORMANCE OF BROILER CHICKENS FED DIETS SUPPLEMENTED WITH DIFFERENT LEVELS OF SUNFLOWER (*Heliathus annus*) SEED OIL FOR SUSTAINABLE POULTRY PRODUCTION

[1]Agubosi O.C.P., [2]Sadiq H.O., [1]Aliyu K.I., [1]Lambe J. and [1]Alexander J.
[1]Department of Animal Science, University of Abuja, Gwagwalada Nigeria
[2]Department of Fisheries, Aquaculture and Wildlife, University of Abuja, Gwagwalada Nigeria
Correspondence: Agubosi, Oluchi C.P., Department of Animal Science, University of Abuja, Gwagwalada Nigeria.Email:agubosi.oluchi@uniabuja.edu.ng

ABSTRACT
This study was carried out to assess the growth performance of broiler chickens given diets supplemented with varying amounts of sunflower (*Heliathus annus*) seed oil. A total of two hundred and ten (210) day old Arbor acre chicks were randomly allotted into seven groups in a complete randomized design (CRD). There were three replicates of each treatment, each including ten (10) birds. A baseline diet was formulated to meet the nutrients (crude protein, metabolizable energy, lysine, Methionine, calcium and phosphorus) requirement of broiler chicks. Treatment 1 birds were given a baseline diet supplemented with 1.2 g/kg of the synthetic antibiotic Neomycin, whereas treatments 2, 3, 5, 6 and 7 birds were given a baseline diet supplemented with 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0 milliliters of sunflower oil, respectively. Feed and clean water were given freely for the duration of the 28-day trial. Data on weight gain and feed consumption were gathered. Feed conversion ratio was computed using data generated from feed consumption and weight gain. All data generated were subjected to analysis of variance (ANOVA). A phytochemical analysis of sunflower oil showed that it included alkaloids (3.86%), tannins (10.83%), phenol (7.06%), terpenoids (5.10%), steroids (4.47%), saponins (3.51%), and flavonoids (10.06%). The growth performance result indicated that there were significant ($P<0.05$) difference in final body weight gain, average weight gain and feed conversion ratio of the birds fed the experimental diets. However, there were no significant ($P>0.05$) difference in the initial body weight, feed consumption and mortality rate. It was observed that birds fed diets containing higher levels (0.7, 0.8, 0.9 and 1.0 mls) of sunflower oil performed significantly better than those fed other experimental diets. This could be attributed to the presence of the bioactive chemicals or secondary metabolites contained in sunflower oil which performs multiple biological activities. These secondary metabolites have been proven to have antibacterial, antiviral, antifungal, antimicrobial and antioxidant properties which promotes the secretion of digestive enzymes, stabilize the ecosystem of gut microflora resulting to better feed utilization, increased nutrient digestibility, nutrient absorption and metabolism.

Keyword: *Antibiotics, Broilers, Performance, Phytochemicals, Sunflower oil*

1.0 INTRODUCTION
World Health Organization (2007) Technical Report on protein requirements in human nutrition states that the average requirement is 0·8 g protein/kg body weight per day, however many developing countries protein intake falls significantly short of this value. This gap in protein requirement can be closed by rearing species of animals with short generation interval, highly prolific and rapid growth (Cheeke, 2005). Poultry have the above characteristics and can convert feed into food products quickly and efficiently. Among the poultry species reared, broiler is the most widely organic meat consumed and predicted to have increased consumer demand and production because of its good source of protein (FAO, 2018). The use of antibiotics have been the most successful way to control diseases and reduce mortality in poultry production. However, the increased use of antibiotics especially as growth promoter for livestock has led in a significant risk of antibiotic resistant bacteria and its residual effects in animals' products constitute adverse effect to consumers (Lee *et al*., 2004). Due to these detrimental impact (antibiotic resistant bacteria, antibiotic residues in animal products and the danger it posed to human health), the European Union in 2006 ban the use of antibiotics in poultry industry and suggested alternatives known as natural growth promoters. Among the potential alternatives used to replace antibiotics are prebiotics, probiotics and most recently essential oil (Zhaikai *et al*., 2015) from plants extract. Essential oils are aromatic oily liquids generated from different parts of the plants such as leaves, barks, flowers and seeds. They can be extracted from plant materials using different extraction methods such as solvent extraction and mechanical extraction using a screw. Among the most commonly used are cold pressing (also known as expression) and steam distillation which is the most popular method and has been employed extensively, particularly in large scale production (Di Leo Lira *et al*., 2009). Essential oils contain secondary metabolites

which have therapeutic properties required for suppression of pathogenic bacteria, scavenge free radicals, reduce oxidative stress, improve animal growth, boost immune system and improve efficient nutrient utilization (Huang *et al*., 2010). Phytochemicals have also been reported to be safe and effective without causing any negative effective on animals once administered in right doses and concentrations (Oluwafemi *et al.*, 2021). One of the potential plants loaded with these secondary metabolites is sunflower (*Heliathus annus*) oil seed. This research was designed to assess the effect of sunflower (*Heliathus annus*) oil as a substitute to antibiotic feed additives on the growth performance of broiler chicks.

2.0 MATERIALS AND METHODS

Experimental site

This research was carried out at the Poultry unit of Animal Science Department, Faculty of Agriculture, University of Abuja Teaching and Research Farm, Main Campus, along airport Road, Gwagwalada, Abuja, Nigeria. Gwagwalada is the headquarters of the Gwagwalada Area Council located between latitudes 08^0 57^1 and 09^0 37^0N and longitude of 70^0 20^l and 07^0 51^0E. Based on climate, the area is mostly characterized by two seasons namely: the raining season which starts late March or most times at the beginning of April and ends in early November while the dry season begins in late November till March. The temperature ranges between 26 - 30^0C and 35 - 39^0C during the raining and dry seasons, respectively (Balogun, 2001).

Collection and Extraction of sunflower oil

Sunflower (*Helianthus annus*) seeds were purchased from local market in Gwagwalada, Abuja and authenticated at Department of Biological Science, University of Abuja, Nigeria. Extraction of the oil was done using steam distillation method technique using Clevenger apparatus. 500g of sunflower milled seed were measured into a round bottom flask and heated for 75^0C for 30 minutes. Steam from the inter goes through a separatory funnel to obtain pure sunflower oil

Experimental Animals, design and their Management

A total of two hundred and ten- day old (210) Arbor acre broiler chicks were obtained from a reliable commercial hatchery in Ibadan. The birds were randomly grouped into seven dietary treatments each with three replications of 10 chicks in a Complete Randomized Design (CRD). The birds were reared in a battery cage with pen dimension of 0.94 square meter. Supplemental heat and light were provided throughout the brooding period using lanterns, electricity and charcoal stoves. Routine vaccination (Gumboro and lasota) were administered. Feed and clean water were given freely for the duration of the 28-day trial..

Experimental Diet

One Isonitrogenous and Isocaloric (CP=23.50%, ME=2897 Kcal/Kg) broiler starter diet was formulated as presented on Table 1. Birds on Diet 1 were given the baseline diet and synthetic antibiotic (Neomycin) at 1.2g/kg while birds on Diets 2, 3, 4, 5, 6 and 7 were fed the baseline diet and essential oil at 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0 mls/kg of feed, respectively. The diet was formulated to meet the nutrient requirement of broiler starter. The experimental layout is shown below:

Treatment 1: Baseline diet + Neomycin at 1.2g/kg of feed
Treatment 2: Baseline diet + 0.5 mls/kg of feed *Helianthus annus oil*
Treatment 3: Baseline diet + 0.6 mls/kg of feed *Helianthus annus oil*
Treatment 4: Baseline diet + 0.7 mls/kg of feed *Helianthus annus oil*
Treatment 5: Baseline diet + 0.8 mls/kg of feed *Helianthus annus oil*
Treatment 6: Baseline diet + 0.9 mls/kg of feed *Helianthus annus oil*
Treatment 7: Baseline diet + 1.0 mls/kg of feed *Helianthus annus oil*

Table 1. Composition of experimental diet for broiler starter

INGREDIENTS (Kg)	LEVELS OF SUNFLOWER OIL (M/S)						
	0	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
Maize	57.15	57.15	57.15	57.15	57.15	57.15	57.15
Groundnut cake	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Soya bean cake	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Fish meal local	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30
*Vitamin premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.35	0.35	0.35	0.35	0.35	0.35	0.35
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Proximate Analysis							
Nutrients	**0**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
Crude Protein (%)	23.50	23.50	23.50	23.50	23.50	23.50	23.50
Metabolizable energy (Kcal/kg)	2897	2897	2897	2897	2897	2897	2897
Crude fibre (%)	4.05	4.05	4.05	4.05	4.05	4.05	4.05
Ether Extract (%)	4.69	4.69	4.69	4.69	4.69	4.69	4.69
Lysine (%)	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Methionine (%)	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Calcium (%)	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Phosphorus (%)	0.73	0.73	0.73	0.73	0.73	0.73	0.73

*Biomix premix supplied per kg of diet: Vit. A, 10,000IU; Vit. D_3 2000IU; Vit. E 23mg; Vit. K 2mg; Vit. B_1 1.8mg;Vit. B_2 5.5mg; Niacin 27.5mg; Pantothenic acid, 7.5mg; Vit. B_{12} 0.015mg; Folic acid 0.75mg; Biotin 0.06mg; Choline chloride 300mg; Cobalt 0.2mg; Copper 3mg; Iodine 1mg; Iron 20mg; Manganese 40mg; Selenium 0.2mg; Zinc 30mg; Antioxidant 1.25mg.

Data Collection

The following parameters were measured.

Initial weight (IW): The weight of the day-old chicks were weighed and recorded on arrival. **Final weight (FW):** The weight of the broiler chickens were weighed at the end of the experiment. **Average Weight gain (AWG) (g/bird):** This was calculated as final weight gain (g) minus initial weight (g). **Average Daily Weight Gain (ADWG)** per bird was calculated as final body weight minus the initial body weight divided by the total days of the experiment. F**eed intake (FI) (g/bird):** This was estimated as the difference between the feed supplied and left over while average daily feed intake was calculated as total feed intake divided by the total days of the experiment. **Feed conversion ratio:** This was calculated as feed intake (g) divided by weight gain (g). Mortality was recorded as it occurs.

Chemical Analysis

Proximate composition of the experimental diet was determined using procedures of AOAC (2000). The phytochemical analysis of the oil was carried out according to the methods outlined by Harbone (1973).

Statistical Analysis

Data generated on growth performance was subjected to analysis of variance (ANOVA) using SAS statistical package, SAS (2000). Duncan multiple range test (Duncan, 1955) was used to separate the means.. Significant was declared at $P \leq 0.05$.

4.0 RESULT AND DISCUSSION

Phytochemicals composition of sunflower oil

The phytochemical content of sunflower seed oil is presented in Table 2. The results contain alkaloids (3.86%), tannins (10.83%), phenols (7.06%), terpenoids (5.10%), steroids (4.47%), saponins (3.51%), condemned tannins (0.96%) and flavonoids (10.06%), in order of abundance tannins>flavonoids>phenols>terpenoids>steroids>alkaloids>saponins>condemned tannins respectively. The result obtained are in conformity with the values obtained by Chinelo and Ujunwa (2017); Jumuna *et al.* (2014) and Labaran *et al.* (2016). Phytochemicals are natural bioactive compounds that are derived from plants and incorporated into livestocks feed to enhance productivity (Alagbe *et al.*, 2022). The main bioactive compounds of phytochemicals are polyphenols and their composition and concentration vary according to geographical location, parts of the plant, harvesting season, storage, storage conditions, processing methods and environmental factors (Olafedehan *et al.*, 2020). These bioactive chemicals confers plants the ability to execute multiple biological activities such as: anti-inflammatory, antiviral, antifungal, hypolipidermic, antioxidants, anti-allergic, hepato-protective and neuro-protective.

Table 2 Phytochemical composition of sunflower oil

Parameters	% Composition	Tolerable level (%)
Alkaloids	3.86	1.00 - 5.57
Condemned tannins	0.96	1.50 - 6.62
Tannins	10.83	1.52 – 11.00
Phenols	7.06	2.00 - 16.00
Terpenoids	5.10	1.52 - 10.00
Steroids	4.47	0.06 - 4.50
Saponins	3.51	
Flavonoids	10.06	2.00 - 18.00

Growth performance of broiler chicks fed varying inclusion levels of sunflower oil (SFO)

The result of broiler chicks fed varying levels of SFO is presented on Table 3. The amount of sunflower oil added to the broiler chicks' diets significantly ($P<0.05$) affected their final body weight (FBW), average weight gain (WG) and feed conversion ratio (FCR). Nevertheless, there was no significant ($P>0.05$) difference on the initial body weight and feed intake (FI) of birds fed the experimental diets. Broiler chickens fed 0.7, 0.8, 0.9 and 1.0 mls. of sunflower oil had similar final body weight which is significantly higher than the final body weight of birds fed 0.5, 0.6 mls of sunflower oil and the control diet. The higher final body weight observed among birds on 0.7, 0.8, 0.9 and 1.0 mls of SFO could be traced to the activities of phytochemicals which have been proven to stimulate the functions of the intestinal tract to improve digestive secretions, nutrient absorption and metabolism (Alagbe and Oluwafemi, 2019). The average weight gain of broiler chicks was significantly impacted by the varying amounts of sunflower oil they were fed. The average weight gain was found to follow the same pattern as the final body weight gain. The pattern was such that as the level of sunflower oil inclusion level increases the average weight gain also increases. This result agrees with the reports of Zhang *et al. (*2014) who reported increased body weight as essential oil is increased in the diet as growth promoter. Birds fed diet containing 1.00 mls/kg feed had similar feed conversion ratio with those fed 0.9 mls/ kg feed but significantly better than those fed other dietary treatments.

Table 3. Growth performance of broiler chicks fed varying levels of Sunflower oil (SFO)

	Inclusion levels of sunflower oil (mls)								
Parameters	**0.00**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.00**	**SEM**	**LOS**
IBW (g)	39.20	40.00	40.08	41.00	41.10	40.70	40.80	0.26	NS
FBW (g)	905.78^{b}	950.60^{b}	980.55^{b}	1008.8^{a}	1017.53^{a}	1078.4^{a}	1130.78^{a}	28.69	*
WG (g)	866.58^{b}	910.60^{b}	939.75^{b}	967.80^{a}	976.43^{a}	1037.7^{a}	1089.98^{a}	28.52	*
ADWG (g)	30.95^{b}	32.52^{b}	33.56^{b}	34.56^{a}	34.87^{a}	37.06^{a}	38.93^{a}	1.02	*
FI (g)	1566.7	1534.6	1564.33	1548.67	1596	1591	1599.6	9.42	NS
ADFI (g)	55.95	54.81	55.87	55.31	57.00	56.82	57.13	0.34	NS
FCR	1.8^{e}	1.69^{d}	1.67^{cd}	1.60^{bc}	1.64^{cd}	1.53^{ab}	1.47^{a}	0.04	*

IBW: initial body weight; FBW: final body weight; WG: weight gain; ADWG: average daily weight gain; FI: feed intake; ADFI: average daily feed intake; FCR: feed conversion ratio; SEM: standard error of means; LOS: Level of significant ($P<0.05$) difference; T1: basal diet + 0% SFO; T2: basal diet + 0.5 mls SFO;T3: basal diet + 0.6 mls SFO; T4: basal diet + 0.7mls SFO; T5: basal diet + 0.8 mls SFO; T6: basal diet + 0.9 mls SFO; T7: basal diet + 1.0mls SFO.

5.0 CONCLUSION

Sunflower oil contains bioactive chemicals capable of promoting food safety without causing any side effect on continuous use and dietary inclusion of sunflower essential oil at 1.00 mls/kg basal diet in broilers is capable of maintaining good health suppressing the activities of micro-organisms and scavenging free radicals. In order to ensure food safety, increasing healthy poultry production to meet the growing demand globally and to also reduce the high cases of antibiotic resistance diagnosed in human and animals, the use of medicinal plant extracts is highly recommended even as they are effective with no side effects.

REFERENCES

Alagbe, J.O., Shittu, M.D. and Tanimomo, Babatunde K. (2022). Influence of Anogeissusleio carpus stem bark on the fatty acid composition in meat of broiler chickens. *European Journal of*
Life Safety and Stability, 14(22): 13-22.

Alagbe, J.O. and Oluwafemi, R.A. (2019). Performance and haematological parameters of broiler chicks given different levels of dried lemon grass (*Cymbopogon citratus*) and garlic (*Allium sativum*) extract. Research in: *Agricultural and Veterinary Sciences*. 3(2): 102 – 111.

AOAC (2000). Association of Official Analytical Chemists. Official Methods of Analysis 19th Edition Washington, D.C Pages 69-77

Balogun, O. (2001). The Federal Capital Territory of Nigeria: A Geography of Its Development. University of Ibadan Press Limited.

Cheeke, P. R. (2005). Livestock feeds and feeding. 3rd edition pearson Prentice Hall. Upper Saddle River, New Jersey

Chinelo, A,E. and Ujunwa, C. N. (2017). Investigation of phytochemicals and proximate compositions in different parts of Boerhavia diffusa and B. erecta L. *Advances in Sciences*, 2(5):60-63

Di Leo Lira, P., Retta, D., Tkacik, E., Ringuelet, J., Coussio, J. D., Baren, C. and Bandoni, A. L. (2009). Essential oil and by-products of distillation of bay leaves (*Laurusnobilis* L) from Argentina. *Industrial Crops and products*, 30:259-264

Duncan, D. B. (1955). Multiple range and Multiple Test. *Biometrics*, 11: 1 - 42.

FAO (2018). Food and Agriculture Organization of the United Nations, Rome, Italy

Harborne, J. D. (1973). Phytochemical methods: A guide to modern techniques of plant analysis,Chapman and Hall, London. 279.

Huang, Y., Yoo, J.S., Kim, H.J., Chen, Y.J. and Cho, J.H. (2010). Effects of dietary supplementation with blended essential oil on growth performance, nutrient digestibility and blood profile in weaning pigs. *Asian-Australian Journal of Animal Science*, 23: 607-613.

Jumuna, S., Paulsamy, S. and Karthika, K. (2014). In vitro antifungal activity of leaf and root extracts of the medicinal plant, Hypochaeris radicata L. *International Journal Pharmaceutical Science* 5(3): 758-761.

Labaran, I., Lukman, O.A., Adam, J.D. and Usman, M. (2016). Analysis of some phytochemicals and minerals found in aqueous stem bark of Albizia lebbeck. *Dutse Journal of Pure and Applied*, 2(1):231-237

Lee, J. T., Connor-Appleton, S., Haq, A.U., Bailey, C. A. and Cartwritght, A.I. (2004). Quantitative measurement of negligible trypsin inhibitor activity and nutrient analysis of gur meal fractions. *Journal of Agricultural Food Chemistry*, 52:6492-6495

Olafadehan, O.A., Oluwafemi, R.A. and Alagbe, J.O. (2020). Performance, haemato-biochemical

parameters of broiler chicks administered Rolfe (*Daniellia oliveri*) leaf extract as an antibiotic alternative. *Advances in Research and Reviews*, 1:4-10.

Oluwafemi, R. A., Lawal, A. O., Adelowo, S. A. and Alagbe, J. O. (2021). Effects of dietary inclusion of ginger (Zingiber officinale) and garlic (Allium sativum) oil (GGO) carcass characteristics and sensory evaluation of broiler chicken. Journal La Medihealtico, 2(6), 22-31. https://doi.org/10.37899/journallamedihealtico.v2i6.486

SAS (Statistical Analysis System) (2000). SAS User's guide: Version 6.11. SAS Institute,Inc. Cary, North Califonia U. S.A.

World Health Organisation/United Nations University, 2007). Energy and protein requirements Report of a joint FAO/WHO/UNU Expert Consultation. WHO Techanical Report, Series 724. Geneva, Switzerland: World Health Organization.

Zhaikai, Z., Sai, Zhang., Hongliang, W. and Xiangshu, P. (2015). Essential oil and aromatic plants as feed additives in non-ruminant nutrition: a review *Journal of Animal Nutrition and Biotechnology*, 6: 259-264

Zhang, Y., Gong, J., Yu, H., Guo, Q., Defelice, C. and Hernandez, M. (2014). Alginate-whey protein dry powder optimized for target delivery of essential oils to the intestine of chickens. *Poultry Science*, 93:2514-2525

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ISLAMIC FINANCING AND SUSTAINABLE INVESTMENTS: CASE STUDY OF WOMEN ENTREPRENEURS' PATRONAGE OF JAIZ AND TAJ BANKS IN NIGERIA

[1]Sumayya Adam Ahmad & [2]Ganiyat A. Adesina-Uthman
[1]Department of Economics, Nile University of Nigeria, Nigeria
[2]Department of Economics, National Open University of Nigeria, Nigeria
sumyadam2011@gmail.comgadesina-uthman@noun.edu.ng

ABSTRACT
Women's entrepreneurship plays a vital role in economic growth and development in Nigeria. However, Nigerian women entrepreneurs face significant challenges in accessing capital and financial services from conventional banks due to factors such as lack of collateral, gender bias, and limited financial literacy. This study investigates the willingness of women entrepreneurs to patronize Islamic financial banks and products, specifically those offered by Jaiz and Taj Banks in Nigeria, as an alternative to conventional financing options. The research employs an empirical approach, utilizing primary data collected through a survey of 357 women entrepreneurs across multiple states in Nigeria, including Kano, Katsina, Gombe, Abuja, and Lagos. The study employs ordered probit regression analysis to examine the influence of various factors, such as the type of Islamic products offered, education level, marital status, motivation for starting a business, and age, on the willingness of women entrepreneurs to patronize Islamic banks. The findings indicate that the type of Islamic products offered, education level, and marital status are significant determinants of women entrepreneurs' willingness to patronize Islamic banks which has yielded positive business results. Specifically, higher levels of education are associated with greater willingness, while certain Islamic product offerings and being married may have a negative impact on willingness. The study also reveals that factors like religion, location, length of business operation, and household size do not significantly influence the willingness to patronize Islamic banks among the surveyed women entrepreneurs. Based on the findings of the study, the study recommends that Jaiz and Taj banks should implement customized financial literacy programs targeting women entrepreneurs, educating them on Shariah-compliant financing alternatives. This could involve workshops, webinars, promotional materials, and product designs accommodating single and married women. Focused marketing and skills training could expand financial inclusion through Islamic finance research which is imperative for sustainable investment, and hence, development.

Keywords: *Women entrepreneurship, Islamic finance, Islamic banking, Access to finance Islamic financial products, Willingness, Ordered probit regression, Sustainable development*

1.0 INTRODUCTION

Women's empowerment is a crucial issue in global development, as women face discrimination, especially in developing countries, due to societal norms, customs, religion, and cultural expectations (Pieters & Klasen, 2020; Arshad et al., 2021; Rubin et al., 2021). This unreasonable attitude towards women places them at a disadvantage socially, culturally, religiously, economically, and legally. One significant issue is the economic income inequality that affects women worldwide (Pieters & Klasen, 2020). Women also have less authority and decision-making power in the home and public spheres (Arshad et al., 2021; Rubin et al., 2021). They often face conflicts in balancing their roles as spouses or daughters, either dividing domestic chores or foregoing household responsibilities to work (Salia et al., 2018). Alarmingly, women make up 65% of the impoverished population globally (Sikivahan & Ponniah, 2019).

In Nigeria, women's entrepreneurship is recognized as a vital driving force for economic growth and development. However, Nigerian women entrepreneurs face a critical challenge of lack of capital, mainly due to poverty, inadequate access to capital financing, and high interest rates charged by traditional conventional finance (Shukurat, 2022). Internal funding from savings is also limited due to poverty and low income. Access to capital is one of the most crucial elements for women entrepreneurs to start and grow their businesses, but they continually face systemic challenges in accessing finance from conventional banks, hampering their ability to fully participate in the nation's entrepreneurial ecosystem.

Conventional banking systems pose challenges for women entrepreneurs. Lack of adequate collateral is one of the biggest obstacles for Nigerian women entrepreneurs seeking bank loans (Shukurat, 2022). Banks typically require hard assets like property, equipment, or vehicles as security for lending, but restrictive cultural practices often prevent Nigerian

women from inheriting land or property. Most women thus lack the type of assets banks want as collateral, making it difficult to get loans. Even when they possess collateral, women are often required to provide more guarantees than men for similar amounts of money. Deeply entrenched gender bias among loan officers at many Nigerian banks also hinders women entrepreneurs' access to finance (Liew & Yusoff, 2023). Women are perceived as higher-risk borrowers who cannot successfully run businesses, and their enterprises focused on retail, services, or food processing are viewed as less attractive investments compared to men's businesses. This bias often results in the rejection of loan applications from women entrepreneurs despite good business prospects (Hamdan & Kassim's, 2022).

The challenges identified with entrepreneurial development using conventional methods necessitate the search for alternative sources of funding, which the Islamic banking and financial system try to correct. Islamic banks have significant potential to meet the financing needs of Nigeria's women entrepreneurs, but targeted action is required to develop tailored sharia-compliant products, train bank personnel, create awareness among women, and implement monitoring to ensure Islamic banks fulfill their mandate of supporting both men and women business owners.

Therefore, these difficulties pose a challenging question: what are the effects of these Islamic finance and financial products on women entrepreneurs in Nigeria? Reviews of related literature show studies have been made to empirically prove the relationship between women's entrepreneurial performance and alternative sources of capital from Islamic banks (Liew & Yusoff, 2023; Hamdan & Hj Kassim's, 2022; Soemitra et al., 2022; Nawaz et al., 2021). However, most of these studies outside Nigeria or Africa are predominantly in Islamic countries.

2.0 LITERATURE REVIEW

Assessing the willingness of women entrepreneurs to engage with Islamic financial institutions such as Jaiz and Taj Banks in Nigeria, these historical perspectives shed light on potential models and principles that might influence women's decisions. Women entrepreneurs, like their male counterparts, may find appeal in Islamic banks' adherence to ethical and religious principles, such as the prohibition of interest (riba) and emphasis on profit-sharing and partnership-based financing. Ahmad and Qureshi's proposals offer insights into alternative banking frameworks that prioritize societal welfare and equitable wealth distribution, concepts that might resonate with women entrepreneurs seeking financial services aligned with their values. Therefore, understanding women entrepreneurs' attitudes, preferences, and concerns regarding these aspects is essential for evaluating their willingness to patronize Islamic financial institutions like Jaiz and Taj Banks.

Abraham and Meketaw (2023) conducted a study in Assosa town to explore the influence of microfinance services on women's entrepreneurship development. They employed a mixed descriptive and explanatory research design with a quantitative approach, targeting female clients of the Assosa Woreda Microfinance Institution. Their findings suggested that while financial and non-financial services provided by the microfinance institution were deemed insufficient to significantly empower disadvantaged women, saving practices and access to credit positively correlated with women entrepreneurs' progress, particularly in terms of business growth. Liew and Yusoff (2023) examined the support offered by Islamic microfinance institutions to women micro-entrepreneurs during the COVID-19 pandemic in Johor. Utilizing qualitative methods, they discovered that these institutions played a crucial role in sustaining women micro-entrepreneurs amid pandemic challenges.

Similarly, Hamdan and Hj Kassim (2022) investigated the impacts of Islamic microfinancing, human capital development, and ICT utilization on the performance of Malaysian women micro-entrepreneurs funded by Amanah Ikhtiar Malaysia (AIM). Their quantitative study found positive effects of Islamic microfinancing, human capital, and ICT usage on women entrepreneurs' performance. Shukurat (2022) explored the potential of financial inclusion, particularly through the concept of waqf, to enhance women's economic empowerment in developing countries. While based on a literature review, the study highlighted the significance of property, cash, and corporate waqf in fostering women's economic empowerment.

Soemitra, Kusmilawaty, and Rahma (2022) assessed the role of the Micro Waqf Bank in empowering women micro-entrepreneurs, employing a mixed-method approach. Their quantitative findings emphasized the positive impact of joint responsibility systems, financing, and mentoring on micro-enterprise development, with mentoring emerging as particularly influential. Qualitatively, the study underscored the Micro Waqf Bank's role in economically empowering women entrepreneurs.

In contrast, Farzanegan and Badreldin (2022) investigated the relationship between Islamic banking services and entrepreneurship in Muslim-majority countries. Their empirical analysis revealed that the negative impact of Islam on entrepreneurship diminished with the presence of Shariah-compliant financing,

highlighting the importance of such mechanisms in fostering entrepreneurship. Nawaz, Ramzan, and Shahid (2021) explored the impact of microfinance on poverty reduction through women entrepreneurship in Southern Punjab, Pakistan. Their study found that access to finance positively influenced women's entrepreneurial performance, with Islamic microfinance contributing more significantly to sustainable entrepreneurship.

Nugroho and Nugraha (2020) assessed the impact of Islamic banking services and e-commerce on the advancement of MSMEs, highlighting the substantial positive effect of Islamic banks on MSME growth and the complementary role of e-commerce. Reazul and Rubi (2020) investigated disadvantaged women's perceptions of Sharīʿah-compliant micro-equity financing instruments, finding that these instruments were perceived as acceptable and beneficial for entrepreneurs. Setiawati, Wediawati, and Heriberta (2020) explored the effects of Islamic financial literacy and entrepreneurial orientation on business performance among Muslim women entrepreneurs, finding positive impacts on business performance. Chowdhury, Yeasmin, and Zobayer (2018) investigated challenges faced by women entrepreneurs in obtaining financial support from commercial banks in Bangladesh, identifying obstacles such as collateral requirements and institution-specific barriers.

Othman (2015) scrutinized the role of women in leveraging Islamic microfinance for economic growth in Malaysia, aiming to analyze the contemporary effects of Islamic microfinance on women's entrepreneurial endeavors and shared prosperity.
These studies collectively provide insights into various aspects of women's entrepreneurship, including the role of microfinance, Islamic finance, policy frameworks, and institutional factors. Understanding these factors can help assess the willingness of women entrepreneurs to patronize Islamic financial banks and products from Jaiz and Taj Banks in Nigeria, considering the specific socio-economic context and needs of women entrepreneurs in the region.

Theoretical Framework
In his work "Economics of Islam," Ahmad (1952), as referenced by Abas (2013), proposed the establishment of Islamic banks modeled after joint stock companies with limited liability. Ahmad suggested the incorporation of various types of accounts, including current accounts that would not accrue dividends or interest. Additionally, he advocated for the creation of partnership-based accounts, wherein depositors could invest their capital and shareholders would receive higher dividends from resulting profits. Similarly, Qureshi (1946), as cited in Abas (2013), in his exploration of Islam and the Theory of Interest, viewed banking as a societal service akin to public health and education, suggesting government sponsorship. Qureshi's perspective stemmed from the inability of banks to offer interest on deposits or charge interest on loans, instead proposing partnerships with businesses, sharing potential losses. However, Abas (2013) notes a lack of clarity regarding profit-sharing arrangements and responsibility for losses. The notion of partnership between banks and entrepreneurs for capital acquisition was discussed, though specifics remained undefined. Moreover, the idea of banks facilitating trade bill transactions without interest charges using funds from current accounts was put forth.

3.0 METHODOLOGY

Research Design
The research design adopted was a non-experimental descriptive/survey design, chosen to collect and analyze data aiming to uncover relationships or interactions among variables, specifically investigating the correlation between Islamic finance and women entrepreneurship.

Population, Sample Size and Sampling Techniques
The population for the study, comprising women entrepreneurs banking with Islamic institutions like Jaiz Bank and Taj Bank, was considered infinite due to limited available information on their numbers.
To ensure unbiased and objective opinions, the researcher based the population on the total number of women banking with Jaiz Bank and Taj Bank in five states and the namely, F.C.T Abuja, Kano, Katsina, Gombe, and Lagos, selected for having the highest number of branches of these banks.
Determination of the sample size followed Cochran's formula (1977), chosen for its ability to calculate sample size from an infinite population size, considering factors such as the level of accuracy, confidence level, and degree of variability in the population characteristics.
The choice of Cochran formula lay in its unique characteristics such as allowing for sample size determination from an infinite population size, level of accuracy (sampling error), confidence level, and degree of variability (the distribution of characteristics of the population). Cochran's formula for the determination of an appropriate sample size, for infinite population was given as;

$$n = \frac{n_0}{1+\frac{n_0-1}{N}}$$

Where: the population, in this case is N=infinite (∞) cutomers of the women entrepreneurs banking with Jaiz

and Taj banks in F.C.T Abuja, Kano, Katsina, Gombe and Lagos States.

n_0, however, Cochran (1977) provides the following formula;

$n_0 = {Z^2pq}/{e^2}$

Where: n_0 is the sample size for infinite population

Z is the selected critical values of desired confidence level of p is the estimated proportion of an attribute that is present in the population

q = 1-p

e = the desired level of precision

Assuming the maximum variability which is equal to 50% (p=0.5) and taking 95% confidence level with $\pm 5\%$ accuracy, the calculation for the sample size, n_0 is; p=0.5; q=1-0.5=0,5, e=0.05 and Z=1.96

Thus;

$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05^2)} = 384.16 = 384$

The by substitution, the first equation above becomes

$n = \frac{384}{1+\frac{384-1}{\infty}} \approx 384$

Using the simple random sampling method, the questionnaires were distributed to any customer willing to answer the questions in any of the Islamic Banks to be visited in F.C.T Abuja, Kano, Katsina, Gombe, and Lagos.

Sources and Method of Data Collection

Data collection for this research primarily relied on structured questionnaires as the main source of primary data, adapted from previous works by Shinkafi et al. (2023), Muhammad and Yakasai (2022), and Abdullahi, Othman, and Kassim (2020). To ensure accuracy and accessibility, the questionnaires were physically distributed to respondents, considering their anticipated literacy levels. Trained research assistants, mostly colleagues, facilitated the survey process by administering the questionnaires. The data collection targeted women banking with Jaiz Bank or Taj Bank across various branches in including Kano, Katsina, Gombe, Abuja, and Lagos, aiming to gather firsthand information. Questionnaires were distributed during weekdays, primarily from Mondays to Thursdays, within specified time slots of 11 am to 3 pm, totaling four hours daily. The data collection spanned a period of 26 days to accommodate the study's scope and timeline. The collected information from respondents formed the basis for estimating the research model.

Instruments of data collection centered on fieldwork, with a descriptive survey approach employed to ensure relevance, reliability, and validity of the collected information. The questionnaires were designed with short-answer formats, allowing respondents to tick correct responses or provide numerical inputs such as sales figures. This format aimed to enhance control and guidance for respondents, thereby improving the validity and reliability of the instrument. The questionnaire comprised two sections: Section A gathered demographic information using nominal scale items, while Section B addressed inquiries related to business growth, Islamic financial products, and business structures.

Ordered Probit Model

The ordered probit model was used to address the specific objective one (1) i.e. to assess the willingness of women to patronize Islamic financial banks.

The ordered probit model is an extension of the binary probit model used to analyze ordinal response variables with more than two categories. The mathematical specification of the ordered probit model was as follows: Let y be an ordinal response variable with J categories, coded as 0, 1, 2, ..., J-1. The ordered probit model assumes that there is a latent variable y* that determines the observed ordinal response y such that:

y = 0 if $y^* \leq \gamma_0$

y = 1 if $\gamma_0 < y^* \leq \gamma_1$

y = 2 if $\gamma_1 < y^* \leq \gamma_2$

y = J-1 if $y^* > \gamma_\{J-1\}$

The latent variable y* is assumed to be a linear function of the explanatory variables x and an error term ε, which follows a standard normal distribution:

$y^* = \beta_0 + \beta_1x_1 + \beta_2x_2 + \ldots + \beta_kx_k + \varepsilon$……..(3.1)

where β_0, β_1, β_2, ..., β_k are unknown parameters to be estimated, and x_1, x_2, ..., x_k are the explanatory variables. The ordered probit regression model can be specified as follows:

$ISBanks^* = \beta_0 + \beta_1ISP + \beta_2ISBP + \beta_3Education + \beta_4MaritalS + \beta_5Religion + \beta_6Location + \beta_7Length+\beta_8Noemp + \beta_9Motivation + \beta_{10}Age + \beta_{11}WExperience + \beta_{12}HouseholdSize + \varepsilon$.(3.2)

where ISBanks* is the latent variable representing the propensity to patronize Islamic banks, and ε is the error term assumed to follow a standard normal distribution.

The observed ordinal variable ISBanks is related to the latent variable ISBanks* through the following measurement model:

ISBanks = 0 if ISBanks* $\leq \gamma_0$

ISBanks = 1 if $\gamma_0 <$ ISBanks* $\leq \gamma_1$

ISBanks = 2 if $\gamma_1 <$ ISBanks* $\leq \gamma_2$

ISBanks = J-1 if ISBanks* $> \gamma_\{J-1\}$

The threshold parameters γ_0, γ_1, γ_2, ..., $\gamma_\{J-1\}$ are estimated along with the regression coefficients β_0, β_1, β_2, ..., β_{12}.

The probabilities associated with each category of the ordinal dependent variable ISBanks are given by:

$P(ISBanks = 0) = \Phi(-\beta_0 - \beta_1 ISP - \beta_2 ISBP - ... - \beta_{12} HouseholdSize)$ ……(3.3)

$P(ISBanks = 1) = \Phi(\gamma_1 - \beta_0 - \beta_1 ISP - \beta_2 ISBP - ... - \beta_{12} HouseholdSize)$ ……(3.4)

$- \Phi(-\beta_0 - \beta_1 ISP - \beta_2 ISBP - ... - \beta_{12} HouseholdSize)$ ……..(3.5)

$P(ISBanks = 2) = \Phi(\gamma_2 - \beta_0 - \beta_1 ISP - \beta_2 ISBP - ... - \beta_{12} HouseholdSize)$ ……(3.6)

$- \Phi(\gamma_1 - \beta_0 - \beta_1 ISP - \beta_2 ISBP - ... - \beta_{12} HouseholdSize)$ ……(3.7)

$P(ISBanks = J-1) = 1 - \Phi(\gamma_\{J-1\} - \beta_0 - \beta_1 ISP - \beta_2 ISBP - ... - \beta_{12} HouseholdSize)$ ……..(3.8)

The parameters $\beta_0, \beta_1, \beta_2, ..., \beta_{12}, \gamma_1, \gamma_2, ..., \gamma_\{J-1\}$ can be estimated using maximum likelihood estimation (MLE) by maximizing the log-likelihood function constructed from the probabilities given above.

Where,

Dependent Variable: ISBanks = Islamic banks patronized (ordinal variable with three categories)

0 = Jaiz Bank only

1 = Taj Bank only

2 = Both Jaiz Bank and Taj Bank

Independent Variables:

ISP = Patronize Islamic Banks and use their financial products (binary/dummy variable) ISBP = Type of Islamic Products (categorical variable)

Education = Education of respondents (ordinal/categorical variable)

MaritalS = Marital Status of respondents (categorical variable)

Religion = Religion Affiliation (categorical variable)

Location = Location of the respondents (categorical variable)

Length = Length of Business (categorical variable)

Noemp = Number of employees (categorical variable)

Motivation = Motivation to start Business (categorical variable)

Age = Age of the respondents (categorical variable)

WExperience = Working Experience (categorical variable)

HouseholdSize = Household Size (count variable).

4.0 DATA PRESENTATION AND ANALYSIS

A survey was conducted across five Nigerian states, focusing on the impact of Islamic finance products and access to financing on women entrepreneurs. The survey distributed 384 questionnaires, with Kano receiving the highest number (42%). Out of the 384, 93% were completed and returned, indicating a high response rate. However, 55% of the questionnaires were improperly filled and 2% were missing. Kano had the highest number of completed and returned responses (38%), while Gombe had a perfect response rate (13%). The study provides insights into the geographic distribution and response rates, aiming to understand the relationship between Islamic finance products, financial inclusion, and women entrepreneurs' productivity.

Table 1 Reliability Test

Measures	Statistics
Average interitem covariance	.0267282
Number of items in the scale:	29
Scale reliability coefficient	0.8096

The reliability test measures the average inter-item covariance and scale reliability coefficient. The average inter-item covariance is 0.0267282, indicating that the items in the scale are generally related. The scale reliability coefficient, also known as Cronbach's alpha, is 0.8096, indicating the internal consistency of the scale. A coefficient of 0.7 or higher is generally acceptable for research purposes, while a coefficient of 0.8 or higher is considered good or excellent. In this study, the reported scale reliability coefficient of 0.8096 is considered good or excellent, indicating high internal consistency and reliability.

Demographic and socio-economic Analysis

The demographic analysis presented in the table provides valuable insights into the characteristics of the respondents surveyed in the study on the willingness of women entrepreneurs to patronize Islamic financial banks, specifically Jaiz and Taj Banks in Nigeria.

Table 2 Demographic analysis

	Frequency	Percent
Age of the respondents		
18 to 29 years	91	25.49
30 to 39 years	155	43.42
40 to 49 years	77	21.57
50 to 59 years	34	9.52
Total	357	100.00
Education of respondents		
Post-Graduate Degree	49	13.73
First Degree/HND	130	36.41
Diploma/NCE	153	42.86
Others	25	7.00
Total	357	100.00
Working Experience		
1 to 10 years	162	45.38
11 to 20 years	100	28.01
21 to 30 years	63	17.65
31 years and above	32	8.96
Total	357	100.00
Marital Status		
Single	126	35.29
Married	229	64.15
Others	2	0.56
Total	357	100.00
Household Size		
0-3 persons	186	52.10
4-6 persons	119	33.33
7 persons and above	52	14.57
Total	357	100.00
Location of the respondents		
Kano	148	41.46
Katsina	49	13.73
Gombe	50	14.01
Abuja	77	21.57
Lagos	33	9.24
Total	357	100.00

Source: Authors' Computation (2024)

The survey of Nigerian women entrepreneurs reveals a diverse demographic, with 43.42% aged 30-39 years and 25.49% aged 18-29 years. The majority of respondents have at least a diploma or higher level of education, with 42.86% holding a diploma or NCE and 36.41% having a first degree or HND. The majority have between 1 and 10 years of experience, with 17.65% having 21-30 years of experience. The majority are married, with 64.15% being single, highlighting the challenges faced by married women entrepreneurs. The majority of respondents have households with 0-3 persons, with 33.33% having 4-6 persons, and a smaller proportion having 7 or more persons. The respondents are geographically distributed across several states, providing insight into regional variations and cultural nuances that may influence their willingness to patronize Islamic financial banks.

Empirical Assessment of Women Entrepreneurs' Willingness to Patronize Islamic Financial Banks: A ordered Probit Regression Analysis

The ordered probit regression analysis provided aims to assess the factors influencing the willingness of women entrepreneurs to patronize Islamic financial banks and products from Jaiz and Taj Banks in Nigeria.

Table 3 Ordered probit regression

	Coef.	St.Err.	t-value	p-value
ISP	4.814	579.759	0.01	.993
ISBP	-.151	.081	-1.86	.063
Education	.393	.135	2.92	.003
MaritalS	-.799	.214	-3.74	0
Religion	-3.935	419.105	-0.01	.993
Location	.018	.091	0.20	.84
Length	-.203	.163	-1.24	.213
Noemp	-.194	.154	-1.26	.209
motivation	.23	.19	1.21	.225
age	.245	.163	1.51	.132
WExperience	.165	.16	1.03	.304
HouseholdSize	.155	.167	0.93	.353
Mean dependent var	1.411	SD dependent var	0.792	
Pseudo r-squared	0.141	Number of obs	246	
Chi-square	42.416	Prob > chi2	0.000	
Akaike crit. (AIC)	286.172	Bayesian crit. (BIC)	335.247	

*Note: the asterisks ***, ** and * indicate significance at 1%, 5% and 10% respectively*

Source: Authors' Computation (2024)

The pseudo R-squared value of 0.141 indicates that the model has a relatively low explanatory power, suggesting that there may be other important factors influencing women entrepreneurs' willingness to patronize Islamic banks that are not captured in this analysis. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are crucial in model selection and evaluation, particularly for non-nested models. AIC values balance model goodness of fit and complexity, while BIC penalizes complex models. The choice depends on research goals, with AIC for prediction and BIC for data generation.

ISBP (Type of Islamic Products): The coefficient for ISBP is -0.151 and marginally significant at the 10% level. This negative coefficient suggests that the type of Islamic products offered may have a slightly negative influence on women entrepreneurs' willingness to patronize Islamic banks. It could indicate a need for more attractive or tailored product offerings to cater to the specific needs of women entrepreneurs.

Education: The coefficient for education is 0.393 and statistically significant at the 1% level. This positive coefficient implies that higher levels of education are associated with a greater willingness to patronize Islamic banks among women entrepreneurs.

MaritalS (Marital Status): The coefficient for marital status is -0.799 and statistically significant at the 1% level. The negative coefficient indicates that married women entrepreneurs are less willing to patronize Islamic banks compared to their unmarried counterparts.

Religion and Location: The coefficients for religion affiliation and location are not statistically significant, suggesting that these factors do not have a significant impact on the willingness to patronize Islamic banks in this study.

Length, Noemp (Number of Employees), Motivation, Age, WExperience (Work Experience), and HouseholdSize: The coefficients for these variables are not statistically significant, implying that the length of business, number of employees, motivation for starting the business, age, work experience, and household size do not significantly influence the willingness to patronize Islamic banks among the surveyed women entrepreneurs.

5.0 CONCLUSION AND RECOMMENDATIONS

The study revealed that education positively influenced women's inclination to utilize Islamic banks in Nigeria, whereas marital status had a negative impact. This suggests the necessity for Islamic banks to refine their targeting and marketing strategies to effectively reach different demographic segments. Awareness campaigns should be tailored to cater to both educated and non-educated women, considering the unique needs of single and married clients. Flexible product designs could also be implemented to attract underserved demographics. Furthermore, the study found that longer-operating businesses exhibited less willingness, indicating the importance of extending awareness efforts beyond startup support. This finding resonates with the resource-based view, which underscores the role of knowledge as a valuable resource enhancing competitive advantage (Barney, 1991). Education equips women with the awareness and understanding of Islamic finance, serving as a critical informational resource that facilitates access to financing. This finding is supported by Shettima and Mustapha (2022), who observed significant contributions of Islamic microfinance in Nigeria towards providing startup funds and expanding SMEs. However,

it contrasts with the findings of Abraham and Meketaw (2023), who reported insufficient microfinance support in Ethiopia to empower disadvantaged women substantially. This discrepancy underscores the importance of context-specific research in understanding the nuanced impacts of Islamic finance interventions., which has so far depicted positive results. Therefore, Islamic financing is imperative for sustainable investment and sustainable development.

5.1 RECOMMENDATIONS

Based on the findings of this research work, it is necessary to provide a set of policy recommendations.

The study recommends that both Jaiz and Taj banks should target women entrepreneurs across all education and business experience levels through a customized awareness and financial literacy programs. These programs should aim to educate both new and established women-owned SMEs on the benefits of Shariah-compliant financing alternatives. Implementing tailored workshops, webinars, and promotional materials in collaboration with business development organizations could help address knowledge gaps. Consequently, there's a need for continuous investment by banks in the human capital development of their clients. Additionally, Islamic banks should consider product designs that accommodate both single and married women customers, as marital status was shown to impact willingness. Overall, focused marketing and skills training led by the banks themselves would help foster greater understanding and uptake of services among women entrepreneurs, ultimately expanding financial inclusion through the research topic of Islamic finance, which has proven to be crucial for sustainable development.

REFERENCES

Abas, S. (2013). Islamic banking and investment financing: A case of Islamic banking in Kenya [Unpublished doctoral dissertation]. University of Nairobi.

Abdullahi, A., Othman, A. H. A., & Kassim, S. H. (2020). Enhancing financial inclusion in Nigeria: The role of Islamic finance. *International Research in Technology, Engineering, Science, and Humanities* (IJRTESH), 1(1).

Abraham, A., & Meketaw, M. (2023). The role of microfinance institutions on women's entrepreneurship development. *Journal of Innovation and Entrepreneurship*, 12(17). https://doi.org/10.1186/s13731-023-00285-0

Ahadiat, A., & Mahrinasari, M. S. (2020). Leading entrepreneur' personality towards entrepreneurial intentions in banking sector through religiosity in Indonesia: Moderating role of Islamic financing knowledge. Talent Development & Excellence, 12(1), 1489-1501.

Arshad, S., Imtiaz, A., Gillani, S. M. A. H., & Osman, S. (2021). Is women empowerment a zero-sum game? Unintended consequences of microfinance for women's empowerment in Pakistan. Estudios de Economia Aplicada, 39.

Chowdhury, T. Y., Yeasmin, A., & Zobayer, A. (2018). Perception of women entrepreneurs to accessing bank credit. *Journal of Global Entrepreneurship Research*, 8, Article 32. https://doi.org/10.1186/s40497-018-0118-0

Fareed, F., Gabriel, S., Lenain, P., & Reynaud, J. (2017). Financial inclusion and women entrepreneurship: Evidence from Mexico (Economics Department Working Papers No. 1411). OECD Publishing. https://doi.org/10.1787/c5f3f4c6-en

Farzanegan, M. R., & Badreldin, A. (2022). Islam and entrepreneurship: The role of Islamic banking (MAGKS Joint Discussion Paper Series in Economics, No. 42-2022). Philipps-University Marburg, Faculty of Business Administration and Economics.

Hamdan, N. H. B., & Kassim, S. (2022). The effects of Islamic microfinancing, human capital, and ICT usage on women micro entrepreneurs' performance in Malaysia. *Journal of Islamic Monetary Economics and Finance*, 8(Special Issue), 125-152.

Henry, C., Coleman, S., Orser, B., & Foss, L. (2022). Policies and practices for women entrepreneurs' access to financial capital: Insights from an institutional perspective. Small Business Economics, 58, 1185-1207. https://doi.org/10.1007/s11187-021-00519-8

Liew, X. T., & Yusoff, M. E. B. (2023). The role of Islamic microfinance institution in women micro-entrepreneurs sustainability during Covid-19 in Johor. *Open Journal of Business and Management*, 11, 2321-2342.

Mohammad, T., & Yakasai, M. U. (2022). The impact of Islamic finance towards halal product development and patronizing halal SMEs in Nigeria. *International Journal of Islamic Business & Management*, 6(1), 31-43. https://doi.org/10.46281/ijibm.v6i1.1902

Nawaz, S., Ramzan, M. S., & Shahid, M. S. (2021). Relationship between microfinance and sustainable women entrepreneurial performance: The mediating role of social capital. NUML *International Journal of*

Business & Management, 16(1). https://doi.org/10.52015/nijbm.v16i1.56

Nugroho, L., & Nugraha, E. (2020). The role of Islamic banking and e-commerce for the development of micro, small, and medium entrepreneur businesses. Business, Economics, and Management Research Journal (BEMAREJ), 3(1), 11-24.

Othman, A. H. A. (2015). The impact of cryptocurrencies market development on banks' deposits variability in the GCC region. *Journal of Financial Economics Policy*, 12, 161-184. https://doi.org/10.1108/JFEP-03-2015-0021

Pieters, J., & Klasen, S. (2020). Randomization for women's economic empowerment? Lessons and limitations of randomized experiments. World Development, 127, Article 104784. https://doi.org/10.1016/j.worlddev.2019.104784

Raza Rabbani, M., Asad Mohd, A. M., Rahiman, H. U., Atif, M., Zulfikar, Z., & Naseem, Y. (2021). The response of Islamic financial service to the COVID-19 pandemic: The open social innovation of the financial system. Journal of Open Innovation: Technology, Market, and Complexity, 7, Article 85. https://doi.org/10.3390/joitmc7010085

Rubin, B. C., Renda, T. A., Bellino, M. J., Banks, J. A., Dryden-Peterson, S., Freedman, S. W., & Gonzales, R. G. (2021). Civic reasoning and discourse amid structural inequality, migration, and conflict. In C. D. Lee, G. White, & D. Dong (Eds.), National Academy of Education.

Salia, S., Hussain, J., Tingbani, I., & Kolade, O. (2018). Is women empowerment a zero-sum game? Unintended consequences of microfinance for women's empowerment in Ghana. *International Journal of Entrepreneurial Behaviour and Research*, 24(1), 273-289. https://doi.org/10.1108/IJEBR-08-2015-0182

Setiawati, I., Wediawati, B., & Heriberta, H. (2020). Improvement of business performance through strengthening Islamic financial literacy and entrepreneurial orientation study on women enterprises in Jambi City. *International Journal of Innovative Science and Research Technology*, 5(3), 846-853.

Shettima, A., & Mustapha, B. (2022). Contributions of Islamic finance in alleviating poverty among small and medium entrepreneurs in Borno and Yobe State, Nigeria. *International Journal of Management Sciences*, 9(3), 161-169.

Shinkafi, A. A., Mustapha, S., Yahaya, S., Lawan, Y. S., Muhammad, A., & Baraatu, B. A. (2023). The impact of Islamic finance on entrepreneurship for sustainable economic development in Nigeria. *IRJEMS International Research Journal of Economics and Management Studies*, 2(3), 15-22. https://doi.org/10.56472/25835238/IRJEMS-V2I3P104

Shinkafi, A. A., & Ali, N. A. (2018). Entrepreneurship development in Islamic economics. In R. Asmak Ab (Ed.), New developments in Islamic economics (pp. 3-18). Emerald Publishing Limited.

Shukurat, M. B. (2022). The role of waqf in enhancing the financial inclusion of women entrepreneurs in developing countries. *Journal of Islamic Business and Management*, 12(01), 125-138. https://doi.org/10.26501/jibm/2022.1201-009

Sikivahan, N. B., & Ponniah, V. M. (2019). A conceptual perspective on the impact of microfinance on women empowerment. *International Journal of Recent Technology and Engineering*, 8(2S3), 625-628.

Soemitra, A., Kusmilawaty, K., & Rahma, T. I. F. (2022). The role of micro waqf bank in women's micro-business empowerment through Islamic social finance: Mixed-method evidence from Mawaridussalam Indonesia. Economies, 10(7), Article 157. https://doi.org/10.3390/economies10070157

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

DIGITAL CITIZENSHIP AND SMART COUNTRY BUILDING: A WAY TO MORAL AND BEHAVIORAL CHANGES

Adiat Amoke Odunmbaku
Department of Economics, Georgia State University, Atlanta USA
aodunmbaku1@student.gsu.edu

ABSTRACT
Digital literacy of citizens of a smart country is an essential skill to survival and maintenance of a smart city. The technological advancement associated with smart city building calls for the use of internet for many activities and therefore calls for digital literacy of citizens. Good digital citizenship teaches and shows how people connect and empathize with one another as well as how lasting relationships are created through use of digital tools. Many communications in smart city or country are through internet and are mainly based on text communications. This mode of communication does not permit use of vocal tone, seeing of facial expressions, or the understanding of other non-verbal communications. The occurrence of these can result to quick and harsh judgements about someone leading to problems associated with morals and behaviors and cyberbullying. In view of this, the paper looks into empathy, practice of digital literacy& wellness, as well as digital device security as concept to promote digital citizenship and smooth transition to smart country.

Keywords: *Digital citizenship, Smart country, Moral change, Behavior change*

1.0 INTRODUCTION

Transformation of cities to 'Smart' cities in most cases is to optimize city functions and promote\economic growth through the use of smart technologies and data analysis. This type of transformation involves the use of advanced information and communication technology (ICT) to enhance operational efficiency, information dissemination, quality of government services, and improvement in citizens welfare (Chin and Guthrie 2023).

Communication is a method of creating relationships and sense of belonging in the 21st century, especially with respect to smart city building and is achieved through digitalization (Abbas,2020). Digitalized communication is a branch of formal communication that permits online and transnational interactions. It involves virtualization, facilitate real time communication, development of collective actions, and encourages participatory culture. The disadvantages associated with digital communication usage include spread of disinformation, misinformation, hate speech, and unequal access to communication channels. All these challenges can affect the smooth running of a public sphere (where citizens engage in discussions, debates, and interactions that form the opinion of the community) and a smart city (Chin, 2023).

The use of digital technology as means of communication among citizens brought about the concept of digital citizenship. Digital citizenship is the appropriate and responsible code of conduct when using technology as a means of communication. Thus, it assesses the quality of the responses of individuals to membership in a digital community (Choi et al. 2018).

Digital citizens are people using internet effectively and efficiently as means of communication. A person is transformed to digital citizen when appropriate behaviour is integrated to the use of technological advancement tools (Jennett and Cox, 2018).

Advantages of online communication via digital citizenship are: Dissemination of information; facilitates citizens deliberation, promotion of social integration among users leading to inclusive participation of lower-class citizens in community management and governance (Bouzguenda et al. 2019).

Advantages of online communication via digital citizenship

- Dissemination of information in real time either via websites, government social networking sites, or through questions and answers and see comments written on social media;
- facilitates citizens deliberation on issues concerning the community,
- promotes creation of policy change in a community;
- promotes social integration among users leading to inclusive participation of lower-class citizens in community management and governance.

Relationship between Digital Citizenship and Responsible Use of Technology

This relationship hinges on three principles:

(1) Rules of conduct and law serving as tool to promote respect among digital users;

(2) Education on appropriate use of the digital world, comprising literacy, communication, and commerce;
(3) Protection- a means of staying safe in the digital world, also comprising of rights, responsibilities, security, health and wellness of digital users.

Elements of Digital Citizenship
These are the nine basic elements from which the three principles were formulated. They include;
() Digital access, (ii) Digital commerce, (iii) Digital communication,
(iv) Digital literacy, (v) Digital etiquette, (vi) Digital law, (vii) Digital rights and responsibilities, (ix) Digital health, and (x) Digital security.
Among these elements, only digital communication, etiquette, law, rights and responsibility have direct effect on moral and behavioural changes.
Digital communication involves understanding online mode of communications like email, instant messaging, use of Facebook Messenger and other social media. It facilitates quick responses to messages from other smart city dwellers, creates happiness, limits preventable accidents, and enhance free flow of city system processes.

Digital etiquette are manners of presentation of opinions during digital communication. Due to the requirement of appropriate behaviour and language by some communication media, this promotes change towards these specifications and an indirect change in morals and behaviours of digital users.

Digital laws are rules and regulations used to control some behaviour during online technology usage. They control online users misbebaviours like illegal downloading, plagiarism, hacking, identity theft, cyber-bullying and others. This control facilitates change in behaviour of digital citizens.

Digital rights and responsibilities are set of rights enjoyed by digital citizens like privacy statement and appropriate communication speech by communicators. Overall, the adoption of the ethics on digital use ensures online opinion are balanced through good communication flow, thus enhancing positive change in morals and behaviours of users.
Therefore, the transformation of traditional community citizens to digital citizens is an indirect character education with the objectives of educating and equipping citizens with communication skills digital community building (Ohler, 2011).

In the UK, digital citizenship education is achieved through assemblies, Personal, Social, Health Education (PSHE) in the school system, Citizenship and Computing classes, and through advice and communications addresses to parents. An Example is banning of phones use in classrooms or implementation of codes of conduct for smartphone use (Tandon et al., 2020).

A change in moral and behaviour of citizens of a smart city is viewed possible as a result of adoption of digital communication and placing emphasis on the selected elements as discussed in Table 1 below

1. **Adoption of Digital Etiquette (Code of Conduct)**: This is achieved through
   a. Enforcement and spell out of sound rules to digital citizens via written letters, information dissemination at public places like commuters' stations, and community bill board, or with use of social media.
   b. Discouragement of use of abbreviations in communication contents to prevent misconception on the part of the receiver of the information.
   c. Commitment to manners of dialogues and conversation through the internet, which is often recommended to be "polite".
   a. Avoidance of hostility behaviour towards others during online communication, even if both party disagree on an issue.
   b. Giving credit to others when benefits are derived from their contributions. This fosters love among online users.
   c. Displaying legal behaviours by downloading only legal software from its trusted sources.
2. **Adoption of Appropriate Digital Rights and Responsibility**
   a) Ensuring users are aware of their rights and responsibilities when using digital technologies

b. Ensuring compliance with policies of acceptable use by users as laid down by the authorities, digital laws and ethical regulations surrounding digital technology usage.
Ensuring conscious and responsible use of technology.
Ensuring ethical use of web resources.
Siting source of digital content when used or taken advantage of.
Being aware of the need not to harm other users with irresponsible words and behaviours.
Leaning to report irresponsible behaviours like threats and harassment to appropriate authorities and elders rather than retaliation.
Ensuring cultivation of green ideas that contribute to digital waste reduction through taking advantage of electronic clouds and digital applications.

Promotion of positive ways to use technologies and networks as well as raising awareness of the digital ethics of network users.

3. **Adoption of Digital law**

Being aware of need not to share digital content that holds copyrights with others
Need to respect the opinions of other internet users
Need not to abuse or infringe on other internet users' rights.
Being aware of need not to destroy the morality of the public by not sharing inconsistent digital contents.
Cultivating the habit of not engaging in illegal gaining of access to individuals and organizations computers.

Research Questions

This study therefore proposes a method of achieving moral and behavioural changes of smart community dwellers by proposing the following the hypothesis/questions:

- **RQ1**: Does Digital Etiquette (Code of Conduct) influence positive behavioural changes?
- **RQ2**: Is there relationship between knowing appropriate digital rights and responsibility and positive moral and behavioural changes?
- **RO3**: Does obeying digital law have influence on moral and behavioural changes of digital citizens?
-

2.0 METHODOLOGY

The study was carried out using survey research method. This was chosen because the researcher view it as an obtainable method for deducing opinions of many online users. The survey was designed by the researcher and administered among 100 online users in Yaba Local Government of Lagos State Nigeria. The sample chosen were online users between ages 20 and 40 years chosen randomly across selected tertiary institutions. The questions in the questionnaire administered was based on digital etiquette, rights and responsibilities, and law as they affect moral and behaviours of online users.

Data Analysis

The data extracted from the questionnaire administered was analyzed using descriptive analysis tool.
The descriptive analysis was carried out to know the frequencies and distributions of online users in relation to demographic factors, and digital citizenship related questions.

3.0 RESULTS

Descriptive Analysis

Table 1: Age as Demographic factor of Respondents

Age Ranges (Years)	Percentages
20 - 25	23%
26 - 30	41%
30 - 35	28%
36 - 40	8%
Total	100%

Results of extracted data from the questionnaire administered

1. Digital Etiquette (Code of Conduct)

Table 2: Reaction to Avoidance of hostility behaviour towards others during online communication, even if both party disagree on an issue

Response	Percentages (%)
Use of polite language	17
Being formal in communication	20
Use of same communication manner	35
Ignore derogative statements	15
Point out the error	13
Total	100

2. Appropriate Digital Rights and Responsibility

Table 3: Reaction to reporting of threats and harassment to appropriate authorities rather than retaliation.

Responses	Percentages (%)
Reporting to authorities	13
Ignore the action	35
Reply with criticism to original message	28
Reply with comment that support the original message	5
Share the message among friends	19
Total	100

3. Digital law

Table 4: Reaction to cultivating the habit of not engaging in illegal gaining of access to individuals and organizations computers.

Responses	Percentages (%)
Do not attempt gaining access to others' computer	25
Attempt gaining access if for family members	25
Attempt gaining access if for friends and Pals	23
Discourage friends from illegal access to others computers	10
Report organization cases on illegal access gaining to appropriate authority	17
Total	100

4.0 DISCUSSION

The result of the analysis shows that many online users fall within the age range of 26 – 30 years. Result on digital etiquette (Code of Conduct) elements show that an average of the online users will respond to messages using same communication manner, followed by those that constantly adopt formal communication method. Result on appropriate digital laws and responsibility element shows that majority of online users will ignore breech of digital laws rather than report to appropriate authority or retaliating, followed by those that will reply in same manner.

Results on digital law element shows that same percentage of online users will not attempt gaining access to others computer without permission and attempting to gain access to family members computers Overall, the results on questions in relation to elements of digital citizenship shows that the upholding of these element can have some effect on moral and character modifications as shown by the percentages of the responses of the online users which tilt more towards a positive character.

5.0 CONCLUSION

The results of this study show that the transformation of a community to smart community could contribute to moral and behavioural changes through the adoption of digital citizenship.

REFERENCES

Abbas, A.A. (2020). Digital citizenship behaviours. International Journal of Innovation, Creativity and Change. www.ijicc.netVolume 13, Issue 4, 2020. https://www.researchgate.net/publication/343639316_Digital_Citizenship_Behaviours.

Bouzguenda, I., Alalouch, C., & Fava, N. (2019). Towards smart sustainable cities: A reviewof the role digital citizen participation could play in advancing socialsustainability. Sustainable Cities and Society, 101627 *(PDF) Digital Citizenship Behaviours*. Available from: https://www.researchgate.net/publication/343639316_Digital_Citizenship_Behaviours#fullTextFileContent [accessed Sep 12 2024].

Choi, M., Cristol, D., & Gimbert, B. (2018). Teachers as digital citizens: The influence ofindividual backgrounds, internet use and psychological characteristics on teachers' levelsof digital citizenship. Computers & Education, 121, 143-161. *(PDF) Digital Citizenship Behaviours*. Available from: https://www.researchgate.net/publication/343639316_Digital_Citizenship_Behaviours#fullTextFileContent [accessed Sep 12 2024].

Chin, J.T., 2023. What Makes a City "Smart" and Who Decides? From Vision to Reality in the USDOT Smart City Challenge. Journal of Journal of Urban Technology 30(1):1-29. DOI: 10.1080/10630732.2023.2253708.

Tandon, P., Zhou, C., Hogan, C. M., & Christakis, D. A. (2020). Cell phone use policies in US middle and high schools. JAMA Network Open, 3(5), e205183. https://doi.org/10.1001/jamanetworkopen. 2020.5183.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

FUNCTIONAL COUNSELLING AND TVET-SDG LINKAGE FOR THE ATTAINMENT OF SUSTAINABLE DEVELOPMENT.

Ibraheem Adedayo Adediran
Educational Foundations
National Open University of Nigeria
iadediran@noun.edu.ng

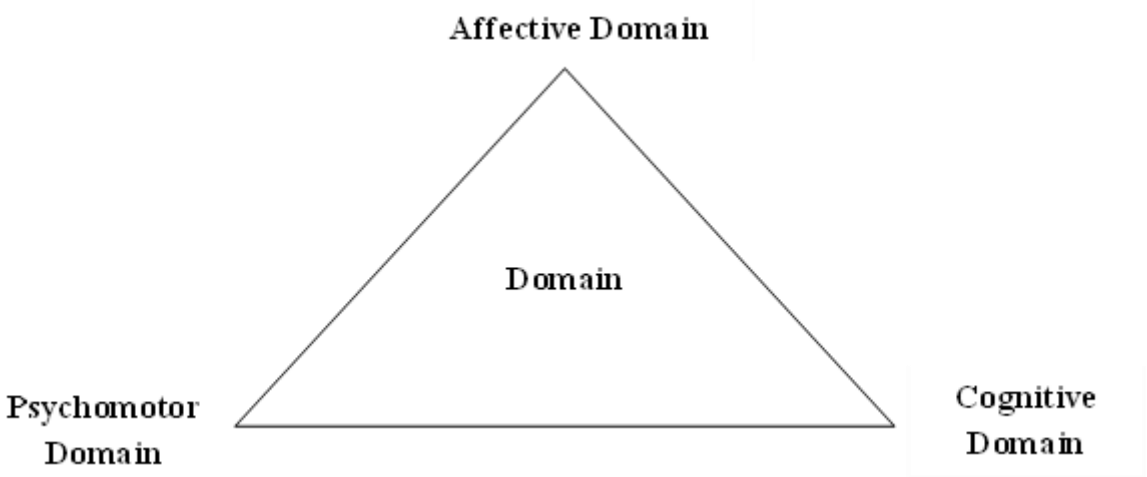
ABSTRACT
Education has three domains that are expected to have direct impact on human culture, civilization and development. They are Affective, Cognitive, and Psychomotor domains. Unfortunately, the domains of Affective and Psychomotor are often defective due to less attention. Meanwhile, they are measures of graduate level of thoroughness and thoroughbred level of reliance and competence. In the same vein, Counselling has three domains that are supposed to have direct impact on human development. They are Educational, Vocational and Socio-personal Counselling. Vocational Counselling in particular is highly germane to the attainment of sustainable development if it is functional counselling channeled towards functional Education. TVET is Technical and Vocational Education Training while SDG is Sustainable Development Goals. TVET is inbuilt into Education System starting from primary to university Institutions but it is facility update and capacity building dependent through Train the Trainers approach. TVET must be made to drive the 17 Goals and 169 targets of the SDGs for Nigeria to be Self-reliant to achieve sustainable development for the Nation. The paper therefore proffers functional counselling and TVET-SDG linkage through some operating models for the realization of Sustainable Development. It equally recommends that Counsellors must be well integrated into all facets of human endeavor and ensure individual Self-discovery and pursuit of his or her right career while all stakeholders in Education and Government In particular must see to the inclusiveness and functionality of education through adequate funding to avoid dysfunctional education, for sustainable development to become a reality in Nigeria.

Keywords: *Education, Counselling, Technical and Vocational Education Training, Sustainable Development Goals, Sustainable Development.*

1.0 INTRODUCTION

Functional Counselling is a product of Functional Education which is a sine-qua-non to TVET-SDG Linkage for Sustainable Development.

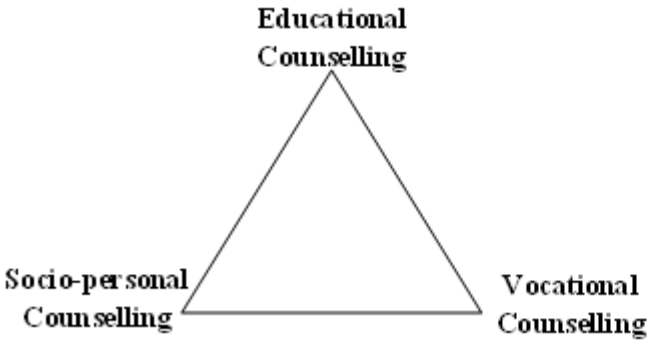
Education has three domains that are expected to have direct impact on human culture, civilization and development. They are Affective, Cognitive and Psychomotor domains. They are measures of graduate level of thoroughness and thoroughbred level of reliance and competence.

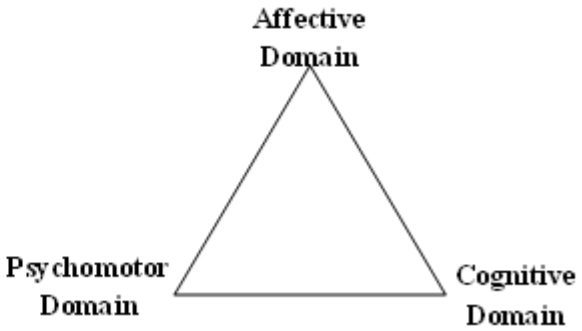


Education must cut across the following abilities; Reading, Writing, Arithmetic or Numeracy, Revising (Recapping), Remembering (Memory recall), Reasoning (Deep thought), Recognizing (interesting), Re-examining (revisiting), Reminding (Recapitulate), Reflecting, Reformatting (reporting). TVET goal is on applicability of acquired knowledge and skill hence TVET graduates must possess the twelve (12) characteristics as well, to be functional and thoroughbred in supporting SDGs. However, this can only be realized if counselling is equally made functional to support achievability of the three domains in Education including Affective and Psychomotor. Counselling functionality is a function of the three categories of Counselling viz Educational, Vocational and Socio-personal. All these must be made functional to drive TVET-SDG linkage for sustainable development.

Functional Counselling and Psychomotor Domain in Education; Counselling Model for TVET.

The much-neglected psychomotor domain must be revitalized by Counselling Effectiveness across all facets of our academic pursuits. The trio of Educational, Vocational and Socio-personal Counselling must be geared towards re-emphasizing the need for our learners to develop the psychomotor skills in them. Vocational Counselling in particular, is a potent tool in assisting the learners to realize their inborn potentials, develop them and channel them towards creativity and innovation. The learners can be assisted with the model below to ensure development of their Psychomotor Domains





.

Table 1:

	Input	Action	Output
A	**Attention**	Pay 100% Attention to unique skills and talents.	Recognition
C	**Competence**	Utilize the skill to the level of competence.	Retention
R	**Relevance**	Make the skill relevant to the current trend of development.	Re-activation
A	**Application**	Ensure you Apply on regular basis for necessary transformation.	Result

2.0 METHOD

This paper is therefore centred on harnessing the opportunities of Technical Vocational Education and Training (TVET) in achieving the 17 points Agenda and 169 Targets of the Sustainable Development Goals for the purpose of achieving Nigeria Sustainable Development. United Nations effort should be appreciated in ensuring that every Nation develops through the Millennium Development Goals, MDG (2000 – 2015) which most nations fail despite foreign grants. For the SDGs (2015 -2030) achievement by Nigeria, the paper is on exploring Technical and Vocational Education and Training, TVET as a vital source, if well developed, for the actualization of Sustainable Development Goals as benefit of functional democracy in the promotion of justice, equity, peace, security and prosperity (employability ansd employment issues). However, for effective contributions of TVET to SDG, the following areas of TVET in Education must be well equipped with high and adequate facilities for teaching and trainings as well as with well-trained teaching staff and Counsellors in all cadres of educational segments or levels:

a. **Secondary Schools:** TVET materials must be supplied to meet the technical demand of effective teaching and service delivery for adequate skill acquisition for prospective world of

entrepreneurship. Curriculum update is equally important at this stage of educational development.

b. **Vocational Centres:** This has to do with taking care of the unemployed ones as a form of empowering them. The goal is for the necessary skill acquisition and self-employment/job creation of the graduates. Artisans from this end should be encouraged to go into Technical Colleges for formal education and training for better job finishing.

c. **Technical Colleges:** The focus must be in producing graduates for self-employment, job creation ad as raw materials base for higher institutions of learning in the relevant fields in Polytechnics and Universities. Integration of Education for Sustainable Development (ESD) into TVET is necessary here to produce thoroughbred graduates. It is interesting to note that Developed countries/Industrial Nations depend so much on the Technical services of NABTEB certificate holders – the Craftmen. This is the appropriate segment of our educational institution that can promote solid TVET foundation for SDGs, hence Government should create more Technical Schools with relevant and adequate facility.

d. **Polytechnic:** The structure of the Polytechnic favours entrepreneurship at Vocational/trade level considering the National Diploma Certificate (ND) and high tech of design, research and development for the graduates and holders of Higher National Diploma (HND) using the advantages of the offered entrepreneurial courses, the Entrepreneurship Centres and available skill as equipment for TVET relevance.

e. **University:** The policy of 30:70 practical/theory ratio needs to be upgraded for the technical content of Universities of Technology to run effectively TVET through entrepreneurship Education to meet up with the SDGs need to provide jobs and employment. The Entrepreneurship Development Centres must be run to meet up with TVET which must be extended to the Artisans for improved proficiency in the technical application/vocation.

3.0 RESULTS

3.1 TVET Development Challenges in Nigeria, Challenges of Education Systems.

Education has three domains that are expected to have direct impact on human culture, civilization and development. They are measures of graduate level of thoroughness and thoroughbred level of reliance and competence as earlier mentioned;

a. **Affective Domain** – Reading, writing and identification ability characteristics of culture of primary school/secondary school learning that directly influence the behaviour and character building of the growing child at his impressionable age. Habits, permanent future character or personality trait of human is determined in this regime. This is a period of identification, numeracy and literacy.

b. **Cognitive Domain –** This is knowledge acquisition that has a characteristics development profile from primary to Polytechnic and University. PhD level is more of possible attitudinal disposition, competence and application and ability to effect development. Professional cap that is research and experience based is the height of knowledge acquisition and development initiative and management in any of the disciplines available in the world.

c. **Psychomotor domain:** - Note the academic/vocation/professional development structure of 6-3-3-4 or 9-3-4 for basic education approach. This is a knowledge based education with affinity for skill acquisition leading to application of Science and products of Engineering and Technology – Industry, infrastructures, and basic amenities for Sustainable Development.

Note that the psychomotor domain dominates the target achievement of Polytechnic education that is more of practical content based bias in admission 70:30 in favour of Technology over Management and Curriculum 60:40 practical-theory ratio. How impactful has our education been to the society in view of the climate of impunity, corruption and indiscipline against the expected claim of standard and civilization? The chart below shows the various disciplines in education. All of the disciplines interconnect in project execution demanding policy plan implementation, project design, due process in construction, manufacturing or production, Inventory, Marketing and Sales which is the import of TVET-SDG linkage. However, effective and function administration enhances versatility and increase contributions in TVET-SDG linkage on project production and services to enhance Nigerian Sustainable Development. Everybody is a stakeholder in this respect even with National Diploma Certificate. There is myriad of challenges of barriers confronting TVET development and Efficiency level in Nigeria ranks them as follows.

3.2 Challenges of Adequate Funding.

At present, public schools being run by Government reveal a lot of lapses due to poor funding. Various authors, Yusuf and Soyemi (2012), Ogba and Wobi (2010) observed the following constraints which adequate funding could remove:

a) Poor perception of TVET.
b) Low enrolment against graduates of Technical schools.
c) Low quality training.

d) Training and labour demand mismatch.
e) Discriminative attitude towards TVET graduates.
f) Weak monitoring, Assessment and Evaluation to affirm quality standard and employability and Societal/Company acceptability.
g) Shortage of qualified and experienced teachers.
h) Poor teaching and learning facilities.
i) Teacher centred approach.
j) Poor management and supervision.
k) Underfunding.
l)

4.0 DYSFUNCTIONAL SUBSYSTEMS CHALLENGE.

With functional Education, religion is better activated and articulated to realize the set objectives of peace and development by reforming the man into scripture compliance and thoroughbred achievers. However, in a situation of mix-up, religion becomes loaded with substance of bias and hatred. This is because issues are trivialized and personalized rather than promoting fairness and values. Nigeria in the past and even now has suffered from misusing religion in some cases as weapons of bias, persecution in selection, choice, evaluation and promotion exercises. Consider the spheres of these subsystems arrangement for a matrix mix to generate sustainable development – Education for capacity building, religion for personal reformation, and politics for the transformation of the Society.

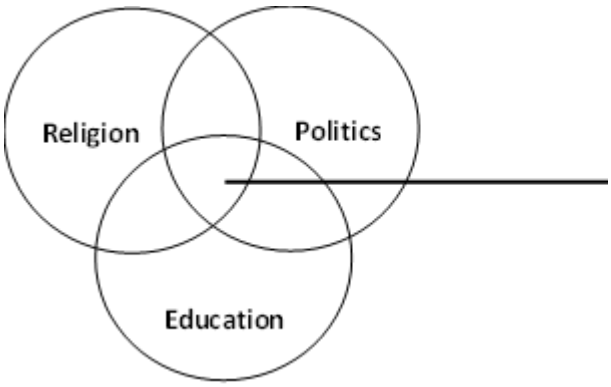


Figure. 3 Matrix of Religion, Politics and Education for Sustainable Development.

5.0 TRANSFORMATION NEED FOR ACADEMIC SUCCESS

The visible impacts of educational deficiencies in our tertiary institutions on the society can be enumerated as follows:

a) Poor maintenance of our infrastructural facilities like water, electricity, roads, telecommunication gadgets and transports etc. hence the need for social transformation. To achieve this, the Nation had adopted education as an instrument per excellence (FGN, 2004), equally the Federal Government had initiated a transformation agenda. Unfortunately, our education system which is supposed to be the pivot of development is also facing some challenges.
b) Need to review the curriculum of some core professional disciplines to reflect the modern needs of the industries.
c) Ensure timely and continuous student assessment on the lectures and weekly evaluation of conducted practical with model marking scheme to ensure uniformity and standard.
d) Introduction of more quantitative internship programmes to some professional training like SIWES (4 months), IT (6 months) etc. Sabbatical leave (1 year) for qualified cadres of lectures.
e) Establishment of entrepreneurial training to tertiary institutions curriculum.
f) Introduction of student work-study programme in colleges.
g) Make our counselling centres more functional to solve student psychological problems.
h) Intensify more on the capacity building needs of the entire Engineering family: Craftsman, Technician, Technologist and Engineers for the purpose of effective service delivery.
i) Ensure membership of professional bodies for each staff as well as participatory attendance of seminars, conferences and workshops relevant to staff discipline.
j) Ensure the end users that are primary stakeholders in engineering education have 100% input to the kind of equipment/facility needed to be procured or supplied through ETF, NBTE or Federal Government.
k) Monitoring the network to ensure work schedule compliance must be developed and adhered to, to ensure competence and standard are achieved for the entire Engineering staff.
l) Working towards achieving the goal and strategic objectives of each department and that of the institution.

Enhancing basic skills and competence largely depends on well trained and certified staff. Effective service delivery in terms of teaching and conduct of practical is a function of facility update, time table compliance, appropriate capacity building for the staff, curriculum review, and up to date to meet up with modern trends in education. Our goal must centre on product development absorbable by the industries that need the students as well as graduate competence to create jobs. This must apply to TVET-SDG linkage. It is quite obvious that one thing that can help us achieve rapid social transformation in Nigeria is sound education leading to academic success (Durosaro, 2011). Research has shown that workers who

were academically successful were more stable in their employment, less likely to engage criminality, more active as citizens, charitable volunteers, happy and healthier workers. There is a need to shift from certificate-driven to employment-driven, functionalism and social transformation by promoting academic success through moulding aright the learners as well as rebranding staff integrity working through the ethics of the profession. All as stakeholders must ensure we correct all lapses in the process of producing our graduates for self-reliance and job creation. Professional callings full attainment is a function of attitudinal change on the part of all the stakeholders.Achieving this is a challenge to Counselling Professionalism.

6.0 TVET-SDGS LINKAGE AND CONCEPT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT

In order to discuss TVET-SDGs Linkage, the concept of Education for Sustainable Development (ESD) must be viewed. UNESCO definition of ESD is that of a vision of Education that seeks to balance human economic wellbeing with cultural traditions and respect for the earth's natural resources (UNESCO, 2005). This implies a desire to train and guide learners towards Income-Generating Activities (IGA) and the development of lifelong skills for survival. TVET as Technical and Vocational Education and Training is therefore a means of supplying the necessary technical tools and competent technical staff to actualize the objective of ESD for the purpose of producing Technical graduate that will be relevant and capable of contributing to the realization of the Sustainable Development Goals. To realize these, the following barriers must be addressed as identified by many interviewees:

a) Curriculum perfection, streamlining and update of courses.
b) Requirements of professional associations.
c) Students understanding of the real issues and targets.
d) Confusion over what to be taught.
e) Lack of markets for students.
f) Lack of relevant course examples.
g) Lack of staff expertise and the need to acquire new knowledge.
h) Lack of staff awareness.
i) Lack of Institutional drive and commitment.

Addressing them would enhance ESD integration into TVET, as well as correcting the thinking of the Principals, Head of Department and Instructors as workforce for the trainees to be responsive by adopting positive attitudes on issues and challenges of sustainability. Graduates of TVET Institutions are expected to develop technical knowledge, skills and attitudes that will require them to live and work in a sustainable way. The table below refers to the specifics.

Table 2: Generic Experience Across TVET Specialists towards Sustainable Development.

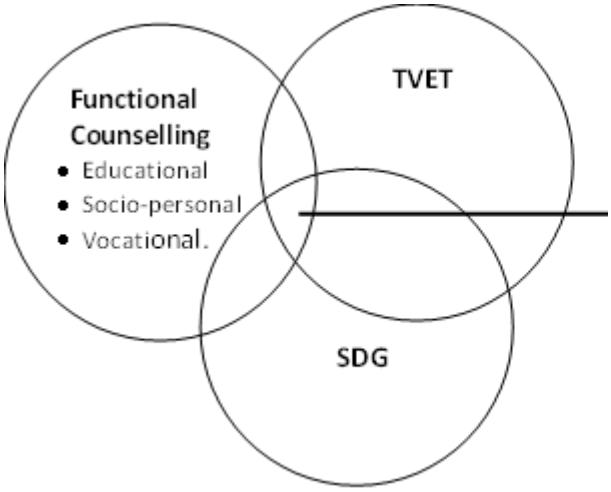
s/n	Experience	Characteristics
1	Knowledge (Cognitive)	- To seek solution in real life situations. - To develop social and experimental responsibility. - To identify, understand and evaluate values conducive to Sustainable Development. - To understand different methodologies of the humanities.
2	Skills (Psychomotor)	- Creativity in inter-disciplinary teams. - Critical Judgment. - Participation in a creative environment. - Transformative learning.
3	Attitudes (Affective)	- To manage change. - To create a stimulating and supportive environment. - Application of the Importance of social, environmental and economic contexts. - Self-reflection.

Table 3: SDGs Agenda 1,2,6,9 and 12 and TVET Relevance.

Sustainable Development Goals (SDGs)				
Goals	**Agenda**	**Goal Statement**	**TVET Relevance**	**Management Challenge**
1	No poverty	End poverty in all its forms everywhere.	Field, Laboratory, Institution, SMEs and Simple constructions. Supervision and Maintenance of flow lines industries.	Resource processing Food, Shelter, Clothing processing through Technology, Science and Management, Commerce and Entrepreneurship.
2.	Zero Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.	Artisan, Craftsmen, Technicians on simple processing equipment maintenance and repair. Fabrications of domestic utensils and farm implements. Establishment of cottage industries for self-employment and job creation.	Resource processing. Establishment of Vocational centres and Technical colleges to offer related courses with high practical content for skill acquisition in the relevant areas of society or community needs TVET in Entrepreneurship, SMEs etc.
6	Clean Water and Sanitation.	Ensure availability and Sustainability management of water and sanitation for all.	Graduate of TVET must be able to participate in drilling well, borehole and treatment of water and work in Water Works.	Resource Processing. Training of Craftmen, Technicians within area, most especially on water treatment for fishery, snailry etc and drinkable water is essential.
9	Industry innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.	TVET graduate on innovation. TVET products as support. TVET graduates to work at the lower rung of the ladder. Promotion of Entrepreneurship for SMEs is essential. TVET products in the area of Building, Environment and Civil Engineering are active in Road Construction.	Resource Processing. Government to be more aggressive on functional infrastructure most especially Power and Road Network and Communication. Government need to focus on Sustainable Development.
12	Responsible consumption and production.	Ensure sustainable consumption and production patterns.	TVET success will eradicate consumerism syndrome and ensure we are productive to value chain level.	Resource Processing Diversification of the economy is in dire need.

			TVET graduates are skillful and relevant in the areas of maintaining and repair of utilities household utensils. They are crucial in the Agro Allied production and products – Fishery, Planting and Harvesting, Snailry, Piggery, Grass cutter, rearing Rabbit etc.	Government need to be aggressive in funding through CBN and Commercial Banks and cause of Vocation and Entrepreneurship. Government must invest on agricultural revolution for production of food in abundance. Patronage of home made goods must be addressed through policies.

Counselling Model for the Trio, for Sustainable Development.



TVET SDGs Linkage and Functional Counselling for Sustainable Development.

7.0 CONCLUSION

To the above effect, registration with Professional bodies, subscription to local and international journals, industry based sabbatical leave and flair for research must be the orientation for staff and students for TVET focus appreciation and actualization of SDGs.

TVET aligns academic imagination to align with industrial reality for graduates to be self-reliant and innovative into entrepreneursip so that Nigeria would move forward technologically. There is a need for Technical Colleges upgrade and proliferation to all local government areas. The 17 Points Agenda with its 169 targets of the SDGs are achievable to the benefit of Nigeria Sustainable Development clamour, if education is appropriately funded to enhance TVET in promoting self-reliance and SMEs on job creation to facilitate industrial development for the Nation. Our work attitude or Productivity and Efficiency must follow how and what obtains in China, Singapore and Malaysia for sustainable development.

TVET can play an instrumental role in developing a new generation of individuals who will front the challenge of achieving sustainable socio-economic development because TVET as an integral component of life-long learning has a crucial role to play in this new era as an effective tool to realize the objectives of a culture of peace, environmentally sound sustainable development, social cohesion, and international citizenship (UNESCO, 1999).

Vocational Education and Training is therefore an important lever to implement sustainability because it reaches people at the interface between learning and work. In addition, TVET puts theoretically acquired skills into implementation of practical importance.

8.0 RECOMMENDATION

The following recommendations will enhance TVET-SDGs Linkage for Nigeria Sustainable Development challenges:

(i) TVET programmes and policy implementation must be based on Curriculum review of Provider institutions to direct focus on Sustainable Development Goals while TVET provider staff must attend capacity building programmes that would empower them to deliver curriculum effectively by comprehending Education role in Sustainable Development, ESD.

(ii) Access to Bank loan at low interest rate and TVET training for the youth and senior citizens at retirement age is a paramount empowerment strategy to facilitate SDGs.

(iii) Government and the Society must remove the barriers of; Dearth of experts on vocational training, poor public impression and apathy to vocation, poor funding, poor remuneration of Vocational Teachers, Facility/Equipment

update challenge for adequate training and poor practical aspect of Vocational Education.

(iv) Counsellors must be well integrated into all facets of human endeavor and particularly to all levels of academic pursuit to ensure individual self discovery and successful pursuits of his or her appropriate God's given career to drive TVET-SDG linkage to success of Sustainable Development.

REFERENCES

Adediran, I.A. & Ajibola A. Ishola (2023). TVET-Sustainable Goals Linkage: Inclusive Education for a Sustainable development. Journal of Innovation of Vocational Technology Education (INVOTEC), 19(1), 1-11. ISSN:1411-5514, E-ISSN:2461-1336: A publication of Faculty Technological and Vocational Education Universitas Pendidkan Indonesia.

Adeokun, O.A. (2017). Functional diversification of the Nigeria economy: Sectoral opportunities for diversification (agriculture, mining and tourism). Shafaudeen Annual Conference, January 25, 2017.

Adegun, O.A & Akomolafe, C.O. (2013). Entrepreneurship education and youth empowerment in contemporary Nigeria. *Scholarly Journal of Education.* 2(5), 52-57.

Amulu, A.I. (2000). Practical training for Engineering personnel, Proceedings of COREN 10th Engineering Assembly, Pp. 63-74.

Awolola, O.O., Olagoke , S.A. & Balogun, M.O. (2011). The effect of environmental layout on degree days, Proceedings of Nigerian Society of Engineers Conference and Annual General Meeting, Abuja.

Bisikay (2008). *Why Managers Can't Lead and Leaders Can't Manage. BCK International, London-New York-Lagos*, pp. 114-115, 101-102, 117.

Chikaiore, J. Orusha, J.O., Onogu B. & Okafor, O.E. (2011). *Technical and vocational education and training: Vehicle for sustainable development in Nigeria.* http://www.sciencepub.net. Academic Arena, 2011:3(12).

Fakunle, D.O. (2011). *Academic success and happy career, a psychological approach.* Positive Press, Ibadan.

International Labour Organization (ILO) (2007). Unemployment, Issues and Challenges. *International Institute of Academic Research and Development*, www.iiardpub.org.

National Policy on Education (2004). African Research Review. Vol. 8(1), Serial No. 32, January, 2014:42-52.

National Bureau of Statistics (2017). Nigeria Poverty Profile, 2017. National Bureau of Statistics.

Okala, O.F. (2003). Funding technical and vocational education to future manpower need and development. *Journal of Vocational Education and Technology*, 1, 63.

Okoye C.U. (1998). Research as a correlate of industrialization in developing economies. Nigerian Society of Engineers (Electrical Division) National Conference, Lagos.

Olagoke, S.A. (2017). *Nigeria and Issues of Security*, SAO Multiventures (Publishers).

Olagoke, S.A. (2015). Toxicology, Pollution Control and Strategic Environment Management

System as Leeway to Sustainable National Development", *Journal of Chartered Institute of Environmental and Public Health Management of Nigeria.* November, Vol.

Olagoke, S.A. & Awolola, O.O. (2012). Natural gas utilization in Nigeria industries: Challenges and the way forward", Proceedings of Nigerian Society of Engineers Conference and Annual General Meeting, December 7, 2012

Olagoke, S.A. & Awolola, O.O. (2010). Entrepreneurship development in the Nigerian Natural Gas Industry". Proceedings of 3rd National Conference, Institute of Technology, Ilorin, May 5-7, pp. 21-23.

United Nations (2002). *Report on the world summit on sustainable development.* New York (A/CONF.199/20)

UNESCO-UNEVOC (2004). *International Centre for Technical and Vocational Education and Training. The Bonn Declaration.* Bonn: UNESCO-UNEVOC.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

EMERGING CYBER CRIMES AND DIGITAL RIGHTS PROTECTION: EVALUATING NIGERIA'S LEGAL AND REGULATORY FRAMEWORKS

Zaynab O. Shittu-Adenuga & Kayode Adenuga
[1]Department of Private and Business Law, College of Law, Fountain University, Osogbo, Nigeria
[2]Cybersecurity, University of Law Business Scholl, Birmingham, UK
zaynaboshittu@gmail.com

ABSTRACT
Nigeria, like much of Africa, has witnessed a remarkable digital revolution in recent decades. As internet access and digital adoption have skyrocketed, the nation's economy has boomed. However, this rapid growth has also opened the door to a new wave of cyber threats. Today, Nigerian citizens face more sophisticated adversaries such as ransomware attacks and crypto-currency related crimes which have negative impacts on personal privacy and security. The study evaluates Nigeria's existing legal and regulatory frameworks, including the Cybercrime (Prohibition, Prevention, etc.) Act, the Freedom of Information (FOI) Act, and the Copyright Act, to assess their effectiveness in addressing these threats while safeguarding citizens' fundamental digital rights. The core question explored in this paper is, can Nigeria effectively address emerging cybercrimes while upholding its citizens' digital rights? This research employed a qualitative methodology by relying on primary and secondary sources of data. Ultimately, the article advocates for a balanced approach that prioritises robust cybersecurity while guaranteeing citizens' rights to privacy, free expression, data protection and access to information. This delicate balance is crucial for ensuring a thriving digital future for Nigeria, where both security and freedom thrive.

Keywords: *Digital Rights, Cyber Crime, Privacy*

1.0 Introduction

Nigeria has experienced an extraordinary rise in digitalisation, profoundly altering how individuals work, live, and handle financial transactions. The country's digital economy is rapidly expanding, encompassing various sectors such as e-commerce, fintech, and digital communications. According to a 2023 report by the National Bureau of Statistics, Nigeria's ICT sector contributed 16.66% to the GDP, underscoring its significant impact on the overall economy.[1] There is a surge in mobile phone usage and internet accessibility has been pivotal in this transformation. The Nigerian Communications Commission (NCC) reported that there are 160.1 million active internet subscriptions in the country as of September, 2023.[2] A recent study by Ericsson Consumer Lab revealed that over 65% of Nigerians engage in remote work at least once a week, a figure that matches or surpasses the levels observed during the pandemic.[3] This transition to remote work underscores the growing dependence on digital technologies for professional tasks. Simultaneously, the uptake of financial technologies also known as fintech such as OPAY, Monie Point etc has increased, presenting a contemporary alternative to traditional cash dealings. Unlike cash, mobile money offers transparent and secure electronic record-keeping, which improves payment security and fosters economic formalisation.[4] Similarly, the rise of entertainment platforms such as YouTube, Prime TV, Netflix etc is a microcosm of Nigeria's digital boom. The presence of accessible entertainment has transformed the viewing habits of Nigerian audiences.[5] These advancements underscore the critical role of digitalisation in driving economic and social changes in Nigeria.

These advancements have however introduced an array of threats and crimes into the cybersecurity world. The digital world is like a double-edged sword for Nigeria. On one hand, the internet and mobile technology are fuelling a massive economic boom and cultural exchange, while on the other hand, **sophisticated cyber threats keep rising. Since 2016, the world has faced a relentless barrage of cybercrime, with attacks**

[1]Leadership NG. (2024, June 3). ICT sector contributed 16.66% to real GDP in Q4 – NBS. *Leadership NG*. Retrieved from https://leadership.ng/ict-sector-contributed-16-66-to-real-gdp-in-q4-nbs/

[2]Businessday NG. (2024, June 3). Nigeria's internet subscribers hit 5-year high on adjusted population figure. *Businessday NG*. Retrieved from https://businessday.ng/technology/article/nigerias-internet-subscribers-hit-5-yrs-high-on-adjusted-population-figure/

[3] Ericsson. (2023, January 1). Unleashing sustainable digital transformation in Nigeria. .Retrieved from https://www.ericsson.com/en/blog/1/2023/unleashing-sustainable-digital-transformation-in-nigeria

[4] Ericsson. (2023, January 1). Unleashing sustainable digital transformation in Nigeria. .Retrieved from https://www.ericsson.com/en/blog/1/2023/unleashing-sustainable-digital-transformation-in-nigeria

[5] Бектурдиев, М. (2022). Nigerian film audiences on the internet. *In The Routledge Handbook of Digital Consumption* (pp. xx–xx). Routledge. https://doi.org/10.4324/9781003080855-13

happening practically every single day.[6] A chilling example emerged years ago in the United States where a criminal mastermind orchestrated the death of a rival through a horrifying cyberattack, by hacking into a hospital's computer system, they manipulated the prescriptions of a patient undergoing a minor surgery. Unaware of the manipulation, a nurse administered the altered medication, tragically leading to the patient's demise.[7] This case highlights the potential lethality of cybercrime and underscores the urgent need to protect our digital world.

2.0 Emerging Cyber Crimes in Nigeria

Cybercrime encompasses any criminal activity that exploits computers, networks, or connected devices. While financial gain is a common motive, cybercriminals can have various goals. Some target devices directly, aiming to damage or disable them. Others weaponize computers and networks to spread malicious software, illegal information, or harmful content. In some cases, both tactics are combined, with criminals infecting machines to create a digital domino effect, spreading malware across networks.[8].

The internet has become a vital tool for Nigerians, offering a wealth of opportunities in business, education, and social connection. However, this digital revolution comes with a dark side: cybercrime. These online scams, ranging from small-time fake lotteries to elaborate international schemes, cast a shadow on Nigeria's reputation. The staggering sum of $242 million stolen by Amaka Anajemba, a figure only a fraction of what she was ordered to repay, paints a grim picture of the potential losses caused by these online crimes.[9] Furthermore, a Nigerian, Okechukwu Valentine Osuji, 39, was recently convicted of wire fraud and conspiracy by a federal jury in New Haven, Connecticut, United States (US) and has faces up to 60 years in prison. The jury convicted Osuji for operating a business email compromise scheme in several countries, including the United States. Osuji and his accomplices, defrauded their victims of over $6.3 million.[10] As of October 2022, Nigeria's anti-graft agency, EFCC, succeeded in convicting 2,847 persons of cybercrime across the country.[11]

Two of the most significant emerging cybercrimes in Nigeria are ransomware attacks and cryptocurrency-related crimes.

1) Ransomware Attacks: Ransomware is a type of malicious software designed to block access to a computer system or data until a ransom is paid.[12] Cybercriminals use various methods to deliver ransomware, including phishing emails, malicious downloads, and exploit kits. Once installed, the ransomware encrypts files on the victim's system, rendering them inaccessible.[13] The attackers then demand payment, often in cryptocurrency, in exchange for the decryption key. In recent years, Nigeria has seen a surge in ransomware attacks targeting both individuals and organizations. These attacks have affected a wide range of sectors, including healthcare, finance, education, and government. The increased use of digital platforms and remote work, accelerated by the COVID-19 pandemic, has further exposed vulnerabilities in cybersecurity defences. One high-profile case involved the ransomware attack on a Nigerian financial institution, where attackers demanded a significant ransom in Bitcoin.[14] The cyberattack disrupted normal operations, resulting in financial losses and harm to the organization's reputation. To counter ransomware threats, Nigerian businesses are investing in cybersecurity defences such as frequent data backups, employee education on phishing scams, and advanced systems for identifying and responding to cyber threats. The Nigerian government, through regulatory bodies like the Nigerian Communications Commission (NCC) and the National Information Technology Development Agency (NITDA).

[6] Schaeffer, B. S., et al. (2009). Cybercrime and cybersecurity: A white paper for franchisors, licensors, and others. Retrieved from https://business.cch.com/franlaw/cybercrime_whitepaper.pdf

[7] Indian Express. (2012, January). Cyberattack. *Indian Express*. Retrieved from https://indianexpress.com/article/opinion/columns/cyber-attack

[8] TechTarget. (n.d.). Cybercrime. Retrieved from https://www.techtarget.com/searchsecurity/definition/cybercrime

[9] Adenusi, D. A., Villanova, et al. (2020). Challenges and way out of cybersecurity issues in Nigeria. Journal of Science, Technology and Management, 2(1), 38.

[10] ICIR Nigeria. (n.d.). Nigerian man bags 60-year imprisonment for cybercrime in US. Retrieved June 4, 2024, from https://www.icirnigeria.org/nigerian-man-bags-60-year-imprisonment-for-cyber-crime-in-us/

[11] Premium Times NG. (2022). Over 2,800 persons convicted of cybercrime in 2022 – EFCC. Retrieved June 4, 2024, from https://www.premiumtimesng.com/news/top-news/562065-over-2800-persons-convicted-of-cybercrime-in-2022-efcc.html

[12] U.S. Senate Committee on Homeland Security and Governmental Affairs. (n.d.). Cryptocurrency ransomware report:ExecutiveSummaryReport https://www.hsgac.senate.gov/wp-content/uploads/imo/media/doc/HSGAC%20Majority%20Cryptocurrency%20Ransomware%20Report_Executive%20Summary.pdf

[13] Chainalysis. (2024). Ransomware 2024. Retrieved from https://www.chainalysis.com/blog/ransomware-2024/

[14] Businessday NG. (2024, July 19). Ransomware victims paid 94 percent of initial ransom amounts – Report. Businessday NG. Retrieved from https://businessday.ng/technology/article/ransomware-victims-paid-94-percent-of-initial-ransom-amounts-report/

2) Cryptocurrency-Related Crimes: Cryptocurrencies are frequently used to commit various illegal activities, including deception, money laundering, and investment fraud. The anonymous nature of cryptocurrencies makes them a popular tool for cybercriminals looking to avoid detection and law enforcement. Nigeria has become a major player in the global cryptocurrency market, with a growing number of individuals and businesses adopting digital currencies. However, this increased use has also led to a surge in cryptocurrency-related criminal activities. Fraudsters exploit the lack of public awareness and weak regulations to carry out scams, including fake cryptocurrency offerings, Ponzi schemes, and deceptive investment platforms. In 2024, the common crypto currency scams are Bitcoin Investment Schemes, Phishing Scams, Pump-and-dump Schemes, Artificial Intelligence Scams etc. The Central Bank of Nigeria (CBN) has implemented guidelines for cryptocurrency use and is partnering with law enforcement to track down and prosecute offenders.[15] In addition, public awareness campaigns are being launched to inform citizens about the risks of cryptocurrency investments and the necessity of conducting thorough due diligence.

3.0 Digital Rights in the Digital Age

Digital rights are the rights individuals have in the digital realm. Digital rights refer to human and legal rights as related to digital media and technologies.[16]They encompass a wide range of freedoms and protections related to accessing, using, creating, and communicating information and data. These rights are essential for ensuring a free, open, and equitable digital society. Digital rights refer to the legal issues concerning the Internet and various software platforms, encompassing the rights of individuals and entities in the digital space[17].Digital rights are the fundamental human rights that apply to the digital world.[18] They are an extension of traditional human rights into the online realm. Nigeria has emerged as a prominent advocate for digital rights and freedoms. While many people associate the word "digital" primarily with online or internet-related activities, its scope extends far beyond the confines of the internet. The realm of digital technology is vast, encompassing a wide range of applications and innovations that operate independently of an internet connection.[19] The United Nations has emphasized that people's offline rights should also be protected online. In resolutions passed in 2012, 2014, and 2016, the UN asserted that digital rights are an extension of existing human rights into cyberspace. This includes the right to privacy, which must be safeguarded regardless of whether an individual is offline or online.[20]

In Nigeria, the digital rights and freedom bill is a testament to the nation's commitment to safeguarding the rights of internet users. In 2016, the bill was introduced into the National Assembly, and after extensive deliberations, the National Assembly transmitted the bill to the President for assent in 2019.[21] This legislation aims to protect citizens from violations of fundamental freedoms in the digital sphere, ensuring that human rights are upheld on digital platforms and media. By establishing a framework for responsible internet use, the bill seeks to address critical issues such as online privacy, freedom of expression, and equitable access to information. The president rejected the bill because it failed to clearly explain certain terminologies and technical aspects, such as lawful interception of communication, digital protection, and data retention.[22] These rights include:

1) Right to privacy: Individuals should have the right to privacy and confidentiality in their digital communications and activities. With the vast amount of personal data shared online, there is a risk of privacy breaches and unauthorized access. The right to privacy is therefore not limited to privacy within a physical space, but cuts across privacy in

[15] Tiwalola, O., & Peretimi, A. (2024). *Overview Of Nigeria's Dynamic Cryptocurrency Regulatory Landscape*. IBA. Retrieved from https://www.ibanet.org/overview-of-cryptocurrency-regulatory-landscape-nigeria

[16] Digital Rights Lawyers Initiative. (2021). *Unraveling The Concept Of Digital Rights* [PowerPoint slides]. Retrieved July 31, 2024, from https://digitalrightslawyers.org/wp-content/uploads/2021/01/UNRAVELING-THE-CONCEPT-OF-DIGITAL-RIGHTS-GROUP-5-POWERPOINT.pdf

[17] Alireza, A. (2024). Digital rights: Future perspectives and horizons. *International Journal of Research in Emerging Law*, 7, Article 10. https://doi.org/10.63053/ijrel.7

[18] Alireza, A. (2024). Digital rights: Future perspectives and horizons. *International Journal of Research in Emerging Law*, 7, Article 10. https://doi.org/10.63053/ijrel.7

[19]Ajayi, O. (n.d.). The existence of digital rights in Nigeria vis-à-vis privacy of citizens and the data protection policies. ALP NG & Co. Retrieved from https://www.alp.company/sites/default/files/ALP%20NG%20%26%20Co%20-%20The%20Existence%20of%20Digital%20Rights%20In%20Nigeria.pdf

[20] Ajayi, O. (n.d.). *The existence of digital rights in Nigeria vis-à-vis privacy of citizens and the data protection policies.*ALPNG&Co.Retrieved from https://www.alp.company/sites/default/files/ALP%20NG%20%26%20Co%20-%20The%20Existence%20of%20Digital%20Rights%20In%20Nigeria.pdf

[21]Paradigm Initiative. (2019). *Digital rights and freedom bill 2019*. Retrieved from https://paradigmhq.org/report/digital-rights-and-freedom-bill-2019/

[22]Paradigm Initiative. (2019). *Digital rights and freedom bill 2019.* Retrieved from https://paradigmhq.org/report/digital-rights-and-freedom-bill-2019/

relation to confidentiality of correspondence, medical information, and personal lifestyle, while accessing internet services. The right to privacy seeks to protect what an individual considers "private" to him including digital rights.[23] Section 37 of the constitution of Federal Republic of Nigeria 1999 (as amended) provides that: "*The privacy of citizens, their homes, correspondence, telephone conversations, and telegraphic communications is hereby guaranteed and protected".*

Furthermore, Article 12 of the Universal Declaration of Human Rights provides that: *"No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks*."[24]

The right to privacy is a fundamental human right that has become increasingly complex to uphold in the digital age. As digital engagements proliferate, so too have cybercrime rates, prompting governments to adopt stringent measures to combat these threats. One of the most contentious of these measures is the collection of personal data, including biometric information. Governments argue that collecting biometric credentials, such as fingerprints and facial recognition data, is essential for national security and the effective prevention of cybercrime.[25] For instance, mobile phone users in Nigeria are required to register their biometric credentials with telecom service providers, linking the ownership of SIM cards and phone numbers with their National Identification Number. This practice aims to create a more secure digital environment by making it easier to track and apprehend cybercriminals. This is also the case for bank account. Citizens are required to submit their bank verification numbers (BVN) and National Identification Number (NIN) that contains sensitive personal information. While these measures are intended to enhance security and streamline identification processes, they raise significant privacy concerns. There is also the broader issue of surveillance and the potential erosion of civil liberties where individuals' movements and activities are continuously monitored, infringing on their right to privacy.[26]

In a United Nations report submitted pursuant to Human Rights Council resolution 48/4 in 2022[27], several recent challenges related to the right to privacy were addressed. These challenges[28] include:

i) Abuse of Intrusive Hacking Tools: The report highlights the growing concern over the misuse of sophisticated hacking tools by state and non-state actors. These tools often referred to as "intrusive hacking tools," can be used to gain unauthorized access to individuals' digital devices, such as smartphones and computers. The abuse of such tools poses a significant threat to privacy, as it allows for the surveillance and monitoring of personal communications, data, and activities without consent. This type of intrusion can undermine personal security, stifle dissent, and erode trust in digital communications.

ii) The Key Role of Encryption: Encryption is a crucial technology for protecting the right to privacy and ensuring that individuals' communications and data remain secure. The report emphasizes that encryption helps safeguard personal information from unauthorized access, including from intrusive hacking and surveillance. By encrypting data, individuals can maintain confidentiality, protect their personal and professional communications, and secure sensitive information from prying eyes. Encryption also supports other fundamental rights, such as freedom of expression and the right to a private

[23] Ajayi, O. (n.d.). *The Existence of Digital Rights in Nigeria Vis-À-Vis Privacy Of Citizens And The Data Protection Policies*://www.alp.company/resources/business-advisory/existence-digital-rights-nigeria-vis-%C3%A0-vis-privacy-citizens-and-data

[24] United Nations. (1948). *Universal Declaration of Human Rights.* Retrieved from https://www.ohchr.org/sites/default/files/UDHR/Documents/UDHR_Translations/eng.pdf

[25] Thales Group. (2023). Biometrics: Definition, use cases, latest news. Retrieved from https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

[26] Ajayi, O. (n.d.). *The Existence of Digital Rights in Nigeria Vis-À-Vis Privacy Of Citizens And The Data Protection Policies*://www.alp.company/resources/business-advisory/existence-digital-rights-nigeria-vis-%C3%A0-vis-privacy-citizens-and-data.

[27] Office of the High Commissioner for Human Rights. (2022). *The right to privacy in the digital age* (Thematic reports, A/HRC/51/17). Retrieved August 1, 2024, from https://www.ohchr.org/en/documents/thematic-reports/ahrc5117-right-privacy-digital-age

[28] Office of the High Commissioner for Human Rights. (2022). *The right to privacy in the digital age* (Thematic reports, A/HRC/51/17). Retrieved August 1, 2024, from https://www.ohchr.org/en/documents/thematic-reports/ahrc5117-right-privacy-digital-age

life, by preventing unwarranted access to private data.

iii) Wide-spread Monitoring of Public Spaces: The report draws attention to the widespread use of surveillance technologies in public spaces, such as CCTV cameras, facial recognition systems, and other monitoring tools. While these technologies are often implemented under the guise of enhancing public safety and security, their pervasive deployment raises serious privacy concerns. The extensive monitoring of public spaces can lead to systems of pervasive surveillance, where individuals are constantly tracked and their activities are recorded. This level of surveillance risks creating an environment of control and conformity, where personal freedoms and privacy are compromised.

2) The right to access the digital space: This right ensures that individuals can connect to the internet and use online services without unreasonable and unnecessary restrictions. This includes access to the internet, digital devices, and digital literacy skills.[29] The importance of this right cannot be overstated, as it underpins many other rights and opportunities in the digital age. Without access to digital space, individuals are at a significant disadvantage in areas such as education, employment, healthcare, and civic participation. The United Nations has recognized the significance of digital access as a component of human rights. [30]

3) The right to remain anonymous: This right allows individuals to use digital services without revealing their identity, protecting them from potential surveillance or discrimination. Users should have the option to protect their identity and personal information while engaging online. The protection of anonymity is a crucial component in protecting both the right to freedom of expression and the right to privacy. Anonymity allows individuals to express themselves without fear of reprisal, and is especially important in countries where freedom of expression is heavily censored. The flipside of anonymity, however, is that it may be used by ill-intentioned individuals to engage in criminal activity or other kinds of wrongdoing, such as online harassment or bullying.[31]

4) Freedom of expression: The right to express opinions and share information freely online without censorship or fear of retribution. Section 39(1) of the 1999 Constitution asserts that "*every person shall be entitled to freedom of expression, including the freedom to hold opinions and to receive and impart ideas and information without interference".*

In 2015, the Freedom House report ranked Nigeria as "partly free" regarding online Freedom of Expression.[32]

5) The right to data justice: This involves fair and ethical treatment of personal data by organizations and entities that collect and process it, ensuring privacy and security. It ensures fair treatment in the collection, use, and sharing of data, addressing biases and inequalities that arise from data practices.[33] On the 8th day of August, 2024, the Federal Competition and Consumer Protection Commission (FCCPC) slammed a $220 million fine on Whatsapp for denying Nigerians the right to control their personal data. The implication of this is that, Whatsapp has allegedly been transferring and sharing Nigerian User data without authorisation.[34]

6) Net neutrality: The principle that internet service providers should treat all data equally, without discrimination or prioritization or charging differently by user, content, or website. David Kaye, the United Nations Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, emphasizes the critical role of net neutrality in the broader context of human rights and democracy. He explains that the mandate of protecting freedom of opinion and expression includes both online and offline environments. As the digital age progresses, states have an obligation to avoid overregulating online platforms and infrastructures, thereby ensuring an environment conducive to freedom of expression. Net neutrality is a fundamental aspect of this, as it prevents internet service providers (ISPs) from deciding what content individuals can access, which would otherwise distort democratic life and restrict access to information.[35]

[29] Office of the High Commissioner for Human Rights (OHCHR). (n.d.). *Digital Rights And Human Rights*. Retrieved August 1, 2024, from https://www.ohchr.org/en/topic/digital-space-and-human-rights

[30] United Nations Human Rights Council. (2016). *The Promotion, Protection And Enjoyment Of Human Rights On The Internet.*

[31] Article 19. (2015). *Right to online anonymity*. Retrieved August 1, 2024, from https://www.article19.org/data/files/medialibrary/38006/Anonymity_and_encryption_report_A5_final-web.pdf

[32] Freedom House. (2015). *Freedom On The Net 2015*: Nigeria report. Retrieved from http://bit.ly/2eyk11G

[33] Taylor, L. (2017). What is data justice? The case for connecting digital rights and freedoms globally. Big Data & Society, 4(2). https://doi.org/10.1177/2053951717736335

[34] Federal Competition and Consumer Protection Commission (FCCPC). (n.d.). Retrieved August 1, 2024, from https://fccpc.gov.ng/

[35] Kaye, D. (2018). Net neutrality is part of the overall struggle for human rights in a digital age. Sur - *International Journal on Human Rights.* Retrieved August 1, 2024, from https://sur.conectas.org/en/net-

7) Digital literacy: The right to acquire knowledge and skills to effectively use digital technologies. Digital literacy, akin to traditional literacy, signifies a competency or capability within a particular topic or field. Recognizing digital literacy as a digital right underscores its importance in enabling individuals to access, understand, and critically evaluate digital information. This right is crucial for ensuring equitable access to opportunities in education, employment, and social participation.[36]

4.0 Legal and Regulatory Responses in Nigeria

Nigeria's current legal framework for digital rights is a patchwork of various laws and regulations, including the Cybercrimes (Prohibition, Prevention, Etc.) Act of 2015, the Nigerian Data Protection Regulation (NDPR) of 2019, and the Freedom of Information Act of 2011. While these laws provide some level of protection, they are often seen as inadequate and fragmented.

1) Cybercrimes Act of 2015: This is Nigeria's primary legislation addressing cybercrimes. It aims to provide a comprehensive legal framework for the prevention, prohibition, detection, prosecution, and punishment of cybercrimes in Nigeria. This act criminalizes a range of activities, including cyberstalking, identity theft, and hacking. However, it has been criticized for its vague definitions and the potential for abuse, particularly concerning provisions related to lawful interception and surveillance.[37] This Act not only aims to address various forms of cybercrimes but also ensures the protection of critical national information infrastructure (CNII), promotes cybersecurity, and safeguards computer systems, networks, electronic communications, data, computer programs, intellectual property, and privacy rights.[38]
2) NITDA Act, 2007: The National Information Technology Development Agency (NITDA) Act was enacted in 2007 to establish the NITDA, which is responsible for creating a framework for the planning, research, development, standardization, application, coordination, monitoring, evaluation, and regulation of information technology practices in Nigeria. The Act aims to foster the development of Information Technology in Nigeria and enhance the nation's position in the global information society.[39]
3) Nigerian Data Protection Regulation (NDPR) of 2019: The NDPR aims to protect personal data and privacy. It imposes obligations on data controllers and processors to ensure data security. Despite its noble intentions, the regulation lacks comprehensive enforcement mechanisms and has not kept pace with technological advancements.[40]
4) Federal Competition and Consumer Protection Commission (FCCPC): The Federal Competition and Consumer Protection Commission (FCCPC) is dedicated to promoting and protecting the interests and welfare of consumers in Nigeria. The commission ensures a wide variety of quality products at competitive prices and adopts measures to guarantee the safety of goods and services. It also works to identify and prohibit anti-competitive practices and abuses of market power offline and online.[41]
5) The Freedom of Information Act, 2011: This Act is a critical piece of legislation that promotes transparency and accountability in government by granting the public the right to access information held by public institutions. This Act also serves as an essential legal response to digital rights in Nigeria, encompassing various aspects of information

neutrality-is-part-of-the-overall-struggle-for-human-rights-in-a-digital-age/

[36] Pangrazio, L., & Sefton-Green, J. (2021). Digital rights, digital citizenship and digital literacy: What's the difference? *Journal of New Approaches in Educational Research*, 10(1), 15–27. https://doi.org/10.7821/naer.2021.1.616

[37] National Assembly of Nigeria. (2015). *Cybercrime (Prohibition, Prevention, etc.) Act* of 2015.

[38] National Assembly of Nigeria. (2007). *National Information Technology Development Agency* (NITDA) Act of 2007.

[39] *National Information Technology Development Agency* (NITDA).

[40] *Nigerian Data Protection Regulation* (NDPR) of 2019

[41] *Federal Competition and Consumer Protection Commission* (FCCPC). (n.d.). IMMPW. Retrieved August 2, 2024, from https://fccpc.gov.ng/immpw/

accessibility, privacy, and the use of digital platforms for information dissemination.[42]

6) The Copyright Act: This Act provides a legal framework for the protection of literary and artistic works. This Act addresses various aspects of copyright in the digital age, offering a legal response to the challenges and opportunities presented by digital technologies.[43]

5.0 Challenges to Digital Rights

Nigeria, like many developing nations, grapples with significant challenges in upholding digital rights.[44] The rapid expansion of technology has outpaced regulatory frameworks, creating a landscape, ripe for exploitation and infringement. However, the protection of digital rights in Nigeria faces several challenges:

1) Ambiguity and vagueness in laws: Existing laws often contain ambiguous and vague terms, leading to varied interpretations and potential misuse. For instance, the Cybercrimes Act's provisions on lawful interception lack clear guidelines, raising concerns about arbitrary surveillance.[45]
2) Internet shutdowns: The recurrent imposition of internet shutdowns, often used as a tool for crowd control, severely restricts freedom of expression and access to information. These shutdowns have detrimental economic and social consequences.[46] A recent example can be seen, during the #Endbadgovernance# protest in Nigeria, when the people experienced poor network services on the first day through to the end of the protest. Citizens insinuated that the government shut down the internet in order to control what individuals would post online regarding the national protest. The Minister of Communications, Bosun Tijani, however denied instructing the telecom companies in the country like MTN Nigeria, Globacom and others to tamper with networks to frustrate protesters participating in the ongoing nationwide protests.[47] The above statement by the Minister is a testament to the fact that the government could at any time interfere with the right of individual to access the internet at any time.
3) Inadequate enforcement mechanisms: Enforcement of digital rights is hampered by inadequate resources, lack of technical expertise, and weak institutional frameworks. This results in limited accountability for violations.
4) Digital divide: Despite significant internet penetration, a digital divide persists, with rural areas and marginalized communities having limited access to digital services. This exacerbates inequalities and hinders the realization of digital rights for all Nigerians.[48]
5) Cybersecurity threats: The rise in cybercrime, including online fraud and hacking, poses significant risks to digital rights. The lack of robust cybersecurity measures and coordination among agencies undermines efforts to protect individuals' online safety.

6.0 Balancing cybercrime prevention and digital rights protection in Nigeria

Striking the right balance between cybersecurity and digital rights is crucial to enable individuals and

[42] *National Economic and Development Authority* (NEDA). (2011). *The Freedom of Information* (FOI) Act, 2011. Retrieved from https://nepza.gov.ng/foia/

[43] National Assembly of Nigeria. (2004). *Copyright Act* Cap C28 LFN 2004.

[44] Akinniyi, T. (2021). Digital rights in Nigeria: Emerging issues and opportunities. Luminate Group. Retrieved from https://www.luminategroup.com/posts/news/digital-rights-in-nigeria-emerging-issues-and-opportunities#:~:text=Some%20of%20the%20frontline%20issues,under%20the%20purview%20of%20Government

[45] National Assembly of Nigeria. (2015). *Cybercrime (Prohibition, Prevention, etc.) Act* of 2015.

[46] Paradigm Initiative. (2021). Londa - Nigeria Digital Rights and Inclusion Report. Retrieved from https://paradigmhq.org/report/londa-nigeria-digital-rights-and-inclusion/

[47] Ripples Nigeria. (2024). Minister denies asking telcos to tamper with network to frustrate protesters. Ripples Nigeria. Retrieved August 2, 2024, from https://www.ripplesnigeria.com/minister-denies-asking-telcos-to-tamper-with-network-to-frustrate-protesters/

[48] Luminate Group. (2021). *Data & digital rights in Nigeria report* [PDF]. Retrieved August 2, 2024, from https://luminategroup.com/storage/1361/Data-%26-Digital-Rights-in-Nigeria-Report-%5BFINAL%5D.pdf

organizations to reap the benefits of digital technologies while safeguarding their rights and interests. Achieving this balance demands careful consideration of legal, ethical, and technical factors, along with the formulation of policies and regulations that ensure the responsible and ethical use of digital technologies.[49] The following are proposed strategies for balancing cybercrime prevention and digital rights in Nigeria:

i) Strengthening legal provisions: This involves the continuous update of legal frameworks to address emerging cyber threats and ensure they are in *pari passu* with international best practices. This also includes defining the scope and limits of surveillance and data retention to prevent misuse and protect privacy.

ii) Enhancing oversight and accountability: Establish independent bodies to oversee the implementation of cybercrime laws and surveillance activities, ensuring they do not infringe on digital rights. Transparent processes for surveillance and data handling must be implemented to allow for public scrutiny and accountability.

iii) Promoting public awareness and education: This involves organising digital literacy programs that would educate citizens about their digital rights and how to protect themselves from cyber threats.

iv) Public engagement: Foster public dialogue on the balance between security measures and digital rights, encouraging informed and active participation in policy-making.

v) Adopting technological solutions: This entails the use of encryption, secure communication protocols, and other advanced technologies to enhance security without compromising privacy.[50]

vi) Collaborative efforts: Promote collaboration between government, private sector, and civil society to develop and implement effective cyber security measures.

7.0 Conclusion and Recommendations

To address the challenges and ensure the protection of digital rights in the face of new cybercrime activities, Nigeria urgently needs comprehensive legislation on digital rights protection that is clear, enforceable, and adaptable to technological advancements. Legislation should prioritize bridging the digital divide by promoting inclusive policies that ensure all Nigerians, regardless of location or socio-economic status, have access to digital services and protections. Furthermore, a secure and rights-respecting digital environment is crucial for Nigeria's socio-economic development. This demands a collaborative effort from the government, civil society, the private sector, and citizens.

[49] Allahrakha, N. (2023). Balancing cyber-security and privacy: Legal and ethical considerations in the digital age. *Legal Issues in the Digital Age*, 4(2), 78–121. https://doi.org/10.17323/2713-2749.2023.2.78.121

[50] Allahrakha, N. (2023). Balancing cyber-security and privacy: Legal and ethical considerations in the digital age. *Legal Issues in the Digital Age*, 4(2), 78–121. https://doi.org/10.17323/2713-2749.2023.2.78.121

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

DETERMINANTS OF CLIMATE-SMART AGRICULTURE ADAPTATION AMONG YAM FARMERS IN SOUTHERN TARABA STATE, NIGERIA

Maryanne Odufa Egbeadumah[1] & Chukwudalu Stephen Ikenwa[1]
[1]Dept. of Agricultural Economics and Extension, Federal University Wukari, Taraba State.
odufay@yahoo.com; odufay@fuwukari.edu.ng

ABSTRACT
Climate-Smart Agriculture (CSA) offers promising strategies for enhancing agricultural resilience and productivity in the face of climate change. This study investigates the determinants of CSA adaptation among yam farmers in Southern Taraba State, Nigeria. Using a multiple regression model, data were analyzed from 120 yam farming households. Results indicated that age, education level, household size, farming experience, farm size, extension access, cooperative membership, and credit access are significant predictors of CSA adaptation ($p < 0.01$). The model explained 78.4% of the variance in CSA adaptation levels. Access to credit ($\beta = 0.085$) and farm size ($\beta = 0.078$) emerged as the strongest predictors. These findings underscore the importance of socioeconomic factors in facilitating CSA adoption and suggest potential policy interventions to enhance climate resilience in smallholder yam farming systems. It is concluded that socioeconomic factors play a crucial role in determining CSA adaptation among yam farmers in Southern Taraba State, Nigeria. These findings have some policy implications: Policymakers should focus on improving financial services tailored to smallholder farmers' needs, such as micro-credit schemes or agricultural insurance programs also, investing in robust agricultural extension systems can significantly boost CSA adoption by providing.

Keywords: *Adaptation, Climate-Smart Agriculture, Nigeria, Southern Taraba State, Yam farmers*

1.0 INTRODUCTION

Climate change poses significant challenges to agricultural productivity and food security, particularly in sub-Saharan Africa (Ayamga *et al.*, 2022). Nigeria, a major agricultural producer in the region, faces increasing threats from rising temperatures, erratic rainfall patterns, and extreme weather events (Abiodun *et al.*, 2019; Ifeanyi-Obi *et al.*, 2017). Yam (*Dioscorea species*), a staple crop and important income source for Nigerian farming households, is particularly vulnerable to these climate-induced stresses (Egbule *et al.*, 2020). Growing yams on 3 million hectares, Nigeria produces more than 60% of the world's supply (Ezebuiro *et al.*, 2020). Beyond domestic usage, yams have the potential to generate money; export possibilities indicate unexplored markets, even if the majority of output is destined for internal urban markets (Olayide *et al.*, 2022; (UNCTAD, 2022). With approximately 16% coming from smallholders who are primarily rain-fed, Southern Taraba State makes a considerable contribution to the nation's yam production (Ezui *et al.*, 2020). With 90% of farmers questioned reporting precipitation losses ascribed to climate change, these vulnerable families now face increasing climate risks (Saeed et al., 2019). Climate-Smart Agriculture (CSA) has emerged as a potential approach to enhance resilience, productivity, and sustainability in the face of climate change (Chandra *et al.*, 2018). It encompasses a range of practices including intercropping, conservation tillage, composting, agroforestry, and improved water management (Kassie *et al.*, 2021). While the potential benefits of CSA are increasingly recognized, its adoption among smallholder farmers remains limited due to various socioeconomic and institutional constraints (Mapfumo *et al.*, 2017). Agricultural output and rural livelihoods in Nigeria are increasingly under danger from climate change (Ojo *et al.*, 2021). In recent decades, there has been a nationwide drop in rainfall of 4% and an increase in the frequency of extreme weather events, with temperatures rising by more than 1°C (Abiodun *et al.*, 2021). It is routinely predicted that key farming zones would see further warming, more variable precipitation, and more intense droughts and floods (Lawal *et al.*, 2020).

Understanding the factors that influence CSA adaptation is crucial for designing effective policies and interventions to promote climate-resilient agriculture. This study aims to investigate the determinants of CSA adaptation among yam farmers in Southern Taraba State, Nigeria, a region where yam cultivation plays a significant role in local livelihoods and food security.

2.0 METHODOLOGY:

2.1 Study Area

The study was carried out in Southern part of Taraba State, Nigeria. The five (5) Local Government Areas (LGAS) that comprise the Southern region are Takum,

Wukari, Donga, Ussa, and Ibi; southern Taraba State is located between longitudes 8°30'E and 10°30'E of the Greenwich meridian and latitudes 8°30'N and 9°30'N of the equator. The region shares borders with the Republic of Cameroun to the southeast, Gassol, Bali, Kurmi, and Karim-lamido LGAs to the north, Nassarawa and Plateau State to the north-west, and Benue State to the southwest, according to the National Population Commission's projection of a 3.5% annual growth rate that brought the population to 1,036,183 as of 2017 (TADP, 2018). As of 2006, the region's surface accounted for 14,099 km and its population approximated 704,900 individuals (NPC, 2015). The region experiences both dry and wet seasons in its tropical environment. April is when the rainy season begins and concludes in October. August and September usually get the most rainfall. Beginning in November and ending in April is the dry season. The southern Taraba has an average yearly rainfall of about 800 and more millimeters. According to TADP (2018), the average daily temperature is 34.4 °C, with a mean low temperature of 14.8 °C observed. The region has Guinea savannah-style vegetation. The research area is generally an agrarian region with over 80% of the population being subsistence farmers, mostly farming cash and food crops such rice, cassava, yams, benniseed, and maize (TADP, 2018).

Data Collection:
The study was conducted in Southern Taraba State, Nigeria, covering three Local Government Areas: Wukari, Ibi, and Donga. Data were collected from 120 yam farming households using a structured questionnaire. Multi-stage sampling was employed to select respondents.

2.2 Model Specification:
The multiple regression model for determining the factors influencing CSA adaptation can be specified as:

$$\mathbf{AI} = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \varepsilon \text{ ----------(1)}$$

Where:
AI = Adaptation dependent variable) (level of CSA adoption)
β_0 = Intercept or constant term
$\beta_1, \beta_2, \beta_3\ \beta_4, \beta_5, \beta_6\ \beta_7, \beta_8$ = Regression coefficients associated with the independent variables
$X_1, X_2, X_3\ X_4, X_5, X_6\ X_7, X_8$ = Independent variables
ε = Error term
X_1 = Age (Years)
X_2 = Gender (Categorical binary) Common coding: 0 = Female, 1 = Male)
X_3 = Household size (Number of individuals)
X_4 = Farm experience (Years)
X_5 = Farm size (Hectares)
X_6 = Extension access (Categorical or Binary Common coding: 0 = No access, 1 = Access)
X_7 = Cooperative membership (Categorical or Binary Common coding: 0 = No access, 1 = Access)
X_8 = Credit access (Binary or Categorical Common coding for binary: 0 = No access, 1 = Access)

3.0 RESULTS AND DISCUSSION:
The Multiple regression model as revealed in Table 1 shows that the R-square is 0.784 and thus indicates that approximately 78.4% of the variance in CSA adaptation level is explained by the included variables. This suggested a goodness of fit of the model. The ANOVA results (F = 2.131, p = 0.001) showed that the model is statistically significant, indicating that the predictors collectively have a significant effect on CSA adaptation.

Table 1; **Results of the Multiple Regression Analysis for determining the factors influencing CSA adaptation**

Variable	Coefficient (B)	Std. Error	Standardized Coefficient (β)	t-value	p-value	Significant	Significance Level
(Constant)	5.737	0.300		19.153	0.000	Yes	1%
Age	0.069	0.189	0.040	0.403	0.005	Yes	1%
Educational level	0.047	0.019	0.234	1.230	0.001	Yes	1%
Household size	0.063	0.004	0.006	0.019	0.002	Yes	1%
Gender	0.002	0.014	0.032	1.032	0.003	Yes	1%
Farming Experience	0.059	0.003	0.018	1.098	0.003	Yes	1%
Farm size	0.078	0.027	0.153	1.576	0.001	Yes	1%
Land Tenure Security	0.055	0.037	0.025	0.250	0.002	Yes	1%
Occupation	0.001	0.024	0.034	0.170	0.001	Yes	1%
Extension access	0.061	0.038	0.045	0.450	0.000	Yes	1%
Access to credit	0.085	0.047	0.051	0.510	0.003	Yes	1%
Member of Cooperative	0.060	0.039	0.142	0.151	0.002	Yes	1%
Awareness of CSA	0.071	0.013	0.016	0.165	0.002	Yes	1%
R-squared	0.784						
Adj R-squared	0.812						
Std. Error of the Estimate	0.5966						

Source: Field Survey, 2023

Age (X_1): $\beta = 0.069$, $p = 0.005$ Significant at 1% level. This implies that for one unit increase in age, the CSA adaptation level increases by 0.069 units, holding other factors constant. This suggested that older farmers are slightly more likely to adopt CSA practices.
Gender (X_2): $\beta = 0.002$, $p = 0.003$ Significant at 1% level. The positive coefficient suggested that male farmers (coded as 1) have a slightly higher adaptation level compared to female farmers.
Household size (X_3): $\beta = 0.063$, $p = 0.002$ Significant at 1% level. The CSA adaptation level increases by 0.063 units for each additional household member. This could be due to the availability of more labor for implementing CSA practices.
Farm experience (X_4): $\beta = 0.059$, $p = 0.003$ Significant at 1% level. Each additional year of farming experience is associated with a 0.059 unit increase in CSA adaptation level. This suggested that more experienced farmers are more likely to adopt CSA practices.
Farm size (X_5): $\beta = 0.078$, $p = 0.001$ Significant at 1% level. The CSA adaptation level increases by 0.078 units for each hectare increase in farm size. Larger farms seem more likely to adopt CSA practices, possibly due to more resources or economies of scale.
Extension access (X_6): $\beta = 0.061$, $p = 0.000$ Significant at 1% level. Farmers with access to extension services have a 0.061 unit higher CSA adaptation level compared to those without access. This highlights the importance of agricultural extension in promoting CSA.
Cooperative membership (X_7): $\beta = 0.060$, $p = 0.002$ Significant at 1% level. Being a member of a cooperative is associated with a 0.060 unit increase in CSA adaptation level compared to those who are not cooperative members. This suggested that cooperative membership facilitates CSA adoption, possibly through information sharing or collective resource access.
Credit access (X_8): $\beta = 0.085$, $p = 0.003$ Significant at 1% level. Having access to credit is associated with a 0.085 unit increase in CSA adaptation level. This is the largest coefficient among the binary variables, indicating that access to financial resources plays a crucial role in CSA adoption.
Standardized Coefficients (Beta) Based on the standardized coefficients (Beta), education level ($\beta = 0.234$) and farm size ($\beta = 0.153$) have the strongest relative influence on CSA adaptation among the variables included in the model.

All factors in the model significantly influence CSA adaptation, with access to credit, farm size, and age having the largest effects. The model suggests that older, more experienced farmers with larger farms, access to extension services, cooperative membership, and credit are more likely to adopt CSA practices. These findings align with previous studies on CSA adoption in sub-Saharan Africa. For instance, Aryal *et al.* (2018) found that farm size and access to credit were significant determinants of CSA adaptation in southern Taraba. Similarly, Kassie *et al.* (2015) highlighted the importance of education and extension services in promoting climate-smart practices among smallholder farmers in in eastern and southern Africa.

4.0 CONCLUSION AND POLICY IMPLICATIONS

This study reveals that socioeconomic factors play a crucial role in determining CSA adaptation among yam

farmers in Southern Taraba State, Nigeria. Access to credit, farm size, and age emerged as the strongest predictors of adaptation. These findings have several policy implications:

- Enhancing access to credit: Policymakers should focus on improving financial services tailored to smallholder farmers' needs, such as micro-credit schemes or agricultural insurance programs.
- Strengthening extension services: Investing in robust agricultural extension systems can significantly boost CSA adoption by providing farmers with necessary information and support.
- Supporting farmer cooperatives: Encouraging and facilitating cooperative membership can enhance social learning and resource sharing for CSA implementation.
- Education and capacity building: Programs targeting improved agricultural education and skills development, especially for younger farmers, could enhance long-term CSA adaptation.
- Land tenure security: Given the positive relationship between farm size and CSA adaptation, policies addressing land tenure security could encourage long-term investments in climate-smart practices.

REFERENCES

Abiodun, B. J., Adegoke, J., Abatan, A. A., Ibe, C. A., Egbebiyi, T. S., Engelbrecht, F., & Pinto, I. (2019). Modeling the impacts of reforestation on future climate in West Africa. *Theoretical and Applied Climatology, 137(3), 2435-2456.* https://doi.org/10.1007/s00704-018-2636-9

Abiodun, B. J., Fuwape, I., Abayomi, A. A., & Ifelebuegu, A. (2021). An analysis of climate change projections and scenarios over Nigeria. *Frontiers in Environmental Research,* 9. https://doi.org/10.3389/fenvr.2021.617759

Aryal, J. P., Rahut, D. B., Maharjan, S., & Erenstein, O. (2018). Factors determining the adoption of multiple climate-smart agriculture practices in the Indo-Gangetic plains of India. *Natural Resources Forum, 42(3), 141-158.* https://doi.org/10.1111/1477-8947.12152

Ayamga, M., Yeboah, R. N., & Dzanku, F. M. (2022). Climate change and food security in Africa. In R. Leal Filho (Ed.), The Palgrave handbook of climate resilient societies (pp. 1-37). *Palgrave Macmillan.* https://doi.org/10.1007/978-3-030-32811-5_85-1

Chandra, A., McNamara, K. E., & Dargusch, P. (2018). Climate-smart agriculture: Perspectives and framings. Climate Policy, 18(4), 526-541. https://doi.org/10.1080/14693062.2017.1316968

Egbule, C. L., Nweze, N. J., & Nwobodo, C. E. (2020). Assessment of yam production and its contribution to household poverty reduction in Anambra State, Nigeria. *International Journal of Economics and Financial Management, 6(1), 1-11.*

Ezebuiro, N. C., Oyeyemi, K., & Obi, C. K. (2020). Vulnerability of white yam production to climate change: implications for food security in Nigeria. *Turkish Journal of Environmental Engineering and Science, 44, 82-101.* https://doi.org/10.5053/ekologiya.2020.2

Ezui, K. S., Bilalia, A., Amedzro, K., Ahmed, J. S., Faloye, O. T., Johnson, P., & Ghoshal, G. (2020). Economics, marketing and export potentials of yam in Nigeria. *International Journal of Agriculture and Rural Development, 23(1), 4830-4840.*

Ifeanyi-Obi, C. C., Togun, A. O., Lamboll, R., Adesope, O. M., & Arokoyu, S. B. (2017). Challenges faced by cocoyam farmers in adapting to climate change in Southeast Nigeria. *Climate Risk Management, 17, 155-164.* https://doi.org/10.1016/j.crm.2017.04.002

Kassie, M., Teklewold, H., Jaleta, M., Marenya, P., & Erenstein, O. (2015). Understanding the adoption of a portfolio of sustainable intensification practices in eastern and southern Africa. Land Use Policy, 42, 400-411. https://doi.org/10.1016/j.landusepol.2014.08.016

Kassie, M., Teklewold, H., Jaleta, M., Marenya, P., & Erenstein, O. (2021). Understanding the adoption of a portfolio of sustainable intensification practices in eastern and southern Africa. Land Use Policy, 55, 61-72.

Lawal, A., Adegoke, J., Abatan, A. A., Afolayan, A., Agbabiaka, H., Olaniyan, E., ... & Oguntunde, P. G. (2020). Observed and simulated climate variability and extremes over West Africa. Climatic Change, 162(2), 767-791.

Mapfumo, P., Onyango, M., Honkponou, S. K., El Mzouri, E. H., Githeko, A., Rabeharisoa, L., Obando, J., Omolo, N., Majule, A., Denton,

F., Ayers, J., & Agrawal, A. (2017). Pathways to transformational change in the face of climate impacts: An analytical framework. *Climate and Development, 9(5), 439-451. https://doi.org/10.1080/17565529.2015.1040365*

National Population Commission (NPC). (2015). Population and housing census of the Federal Republic of Nigeria. Priority Tables, Vol. 1.

Ojo, T. O., Adetoro, A. A., Ogundeji, A. A., & Belle, J. A. (2021). Quantifying the determinants of climate change adaptation strategies and farmers' access to credit in South Africa. Heliyon, 7(4), e06741.

Olayide, O. E., Adeola, R. G., & Yadav, L. (2022). Impacts of climate-smart agriculture on farmers' welfare in Nigeria: Evidence from yam-based farming systems. *Journal of Cleaner Production, 349, 131475.*

Saeed, F., Bethke, I., Fischer, E., Legutke, S., Shiogama, H., Stone, D. A., & Schleussner, C. F. (2019). Biased assessment of global warming in climate models. Nature Climate Change, 9(6), 478-483.

Taraba Agricultural Development Programme (TADP). (2018). Annual Report. Jalingo, Nigeria. 78

United Nations Conference on Trade and Development UNCTAD. (2022). Commodity profile: Yam. https://unctad.org/commodities

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

FINANCIAL FLOWS AND SOCIAL SUSTAINABILITY DEVELOPMENT IN NIGERIA

Obadeyi, J.A, Ariyibi, M.E., and Agbatogun, T.O.
obadeyi.james@oouagoiwoye.edu.ng[1] ariyibimayowa@gmail.com[2] agbatoguntaofeek@oouagoiwoye.edu.ng[3]
Corresponding author: ariyibimayowa@gmail.com

ABSTRACT
The financing of the three inter-related pillars of sustainable development goals has been neglected by the United Nation Leaders in the reconstruction of the goals in 2015. The social sustainability development of the country is important to the attainment of goal 4 (Quality Education) which implies the examining of the financial option that would aid in the achievement of this goal on or before 2030. The study employed secondary data that was sourced from the Central Bank Statistical Bulletin and World Development indicator. The period of the inquiry was between 1991 to 2022 both years inclusive. The financial flows were measured with foreign direct investment, foreign aid, remittances, net exports, external debt (external flows), and government expenditure for education and health, and tax revenue (Internal flows). The social sustainability was measured with primary school enrolment rate. The study employed the auto-regressive distributed lag to determine the short and long-run relationship between the outcome variables and explanatory variables. The findings revealed that remittances and external debt has positive significant effect on primary school enrolment rate in Nigeria while government expenditure on education has negative significant effect on primary enrolment rate in Nigeria. It is therefore concluded that remittances and external debt are external flows that would increase the primary school enrolment rate in the country while effective utilization of government expenditure on education would increase the primary school enrolment rate in Nigeria. It is therefore recommended that government should ensure transaction cost does not reduce remittances into the country and ensure external debt and government expenditure on education are expended to educational sector to improve primary school enrolment rate.

Keywords: *Financial Flows; Social Sustainability Development; External flows; internal flows*

1.0 INTRODUCTION
The attainment of development is a function that ensures, the absorptive capacity of all the micro-agents in the economy sustains such development now and in the future because that is when development and growth can be attained holistically. Development is strategic, inclusive, and multi-dimensional in its attainment, because it warrants the buoyancy of all the agents in the economy's circular flow of income, to be desirous of sustaining growth. It is against this backdrop that locates the African continent, to be a crawling and stifling continent, being weighed in the achievement of its sustainable development goals (Akanle, 2014). The neglect of the country pushing towards resolving its visible developmental challenges has a spill-over effect on other developed countries who intend to take advantage of the labor availability and density in the knowledge bank that can be an asset to developed economies and multi-national organisation, due to the increase in the level of world globalization (Akanle, 2014; Sachs, Schmidt, Kroll, Lafortune, Fuller and Woelm, 2020).

The development mantra of "Sustainable development" was launched in United Nations in 1987, after World War II. A report was published titled "Our Common Future" by the World Conference on Environmental and Development. The published article defined sustainable development as the proponent that ensures that future generation can meet their own economic, social, and environmental needs when the need of the present generation is also met now (Voica, Panuait, and Haralambie, 2015; WCED, 1987). The United Nations leader at that conference determined that development should be captured from the standpoint or pillars of economic sustainability, environmental sustainability, and social sustainability, not only that but development that would be sustainable must have international and national specifics.

However, the household/people remain a germane component towards the attainment of social sustainable development goals in Nigeria. Sustainable Development report forecasted that sixty million Africans could suffer from poverty and food security, while about one hundred and ten million African children may not have lucid primary education and a good healthcare system at their disposal, to improve their social status. (Bamidele, Elumah, and Adelowokan, 2022; Olanrewaju, 2022; World Bank in Nigeria, 2022). According to the World Bank report of 2022 which reported that four people out of twenty individuals in the country live below the national poverty line. These are worrisome facts and figures that show the importance of the country chunking out financial options that would help the country reduce

the menace of poverty, improve the health infrastructure and propel the educational quality of the people toward the attainment of goal one to four of the sustainable development goals. (Bamidele, et al, 2022; Olanrewaju, 2022; World Bank in Nigeria, 2022; SOS, 2022).

This makes the attainment of quality education which is goal four of the interrelated goals, from the sustainable development goals that was rolled out in 2015, due to the un-attainment and lack of funding options of the goals in 2020 and still present in the 2015 agenda that is expected to be achieved by developed, developing and emerging countries on or before 2030. To remedy, this social sustainable plague, the government in various stages and political level had either subsidized or directly funded the educational sector in Nigeria. Available data on public expenditure in education revealed that between 2005-2007 and 2011- 2020, the percentage of it was around 6.3%, 7.8%, 8.7%, 9.3%, 9.86%,10.1%, 10.5%, 10.7%, 7.9% and 7.4% respectively (Nenbee & Danielle., 2021). It still shows a poor level of funding, towards the improvement of attainment of primary school education in Nigeria.

Based on this above premises, this study examines into the effect of financial flows (external and internal) towards the attainment of social sustainability measured with the primary school enrolment rate in Nigeria.

2.0 THEORETICAL FRAMEWORK

2.1 The Human Capital Theory

The theory emphasizes the importance of investment in education and technical skills for individual productivity (Becker, 1962; Schultz, 1961). It posits that investing in the education of the population leads to increased productivity, efficiency, and comprehensive socio-economic development. Schultz (1961) describes the human capital theory as focusing on educational investment to achieve socio-economic development goals. Education is considered a productive force within the economy, influencing factors such as social progress, productivity, growth, and technological innovation (Becker, 1994; Benhabib and Spiegel, 1994). From this perspective, education is seen as a deliberate investment that enhances the labor force, boosts individual and organizational productivity, and drives national development and growth. Human capital theory suggests that individuals make various investment decisions based on their educational capital. Financial inflows into a country can support higher educational attainment and health improvements, which are crucial channels for development. Increasing foreign inflows, especially remittances, can alleviate financial and credit constraints, thus promoting productive investment. Remittances, in particular, have a positive effect on educational investment in children by easing credit constraints and reducing household risk, enabling families to invest more in education (Ali Baret et al., 2022).

2.2 Review 0f Literature

Onyekwelu (2022) examined international capital inflows and human capital development in Nigeria. Other specific objectives is to investigate the effect of foreign portfolio investment on human capital development in Nigeria, examine the effect of external debt stock on human capital development in Nigeria, determine the effect of foreign direct investment on human capital development in Nigeria, access the effect of official development assistance on human capital development in Nigeria. The study adopted an *ex-post facto* research design because the data for the study are secondary data which were sourced from the Central Bank of Nigeria (CBN), Statistical Bulletin and Annual reports and Statement of Accounts, The data were analyzed with econometric techniques involving descriptive statistics, Augmented Dickey Fuller Tests for Unit Roots and the Ordinary Least Square (OLS). The result of the study indicates that foreign portfolio investment, external debt stock, foreign direct investment and official development assistance has positive and significant effect on human capital development index (HDI). The study concludes that international capital inflow has positive effect on human capital development in Nigeria within the period under review. In line with the objective of the study, the study recommends that, there is the need for greater foreign participation in the stock market which could enhance foreign portfolio investment in the country and maintain sustainable human capital development. External debts should be contracted solely for economic reasons and not for social or political reasons. An effective policy should be made based on the fiscal and monetary policies which should be aimed at achieving a realistic foreign direct investment in human capital development in Nigerian. Since theories have supported that these capital channels should boost human capital development in Nigerian, it is pertinent that Nigeria government should investigate the spending pattern of the funds obtained through official development assistance.

Oloke, Olabisi, Johnson, Awofala and Aderemi (2022) examines into the nexus between foreign capital inflows and human capital development in Nigeria spanning from 1990 to 2020. This study relied on secondary data which was sourced from the World Development Indicators. Consequently, the FMOLS method was utilized to analyze the data. The findings revealed that trade openness has a negative and significant relationship with human capital development. In the same vein, FDI and portfolio investment have a significant inverse relationship with human capital development in Nigeria. However, official development assistance has a direct

relationship with human capital development, the relationship is significant at 10 percent level of significance. And exchange rate has a positive and significant relationship with human capital development. Both external debt and remittances have insignificant positive relationship with human capital development in Nigeria. In a nutshell, the majority of the inflows of foreign capital in Nigeria have a significant and negative relationship with human capital development in this study. Steaming from the above findings, this study recommends that the policymakers in Nigeria should deploy the inflows of foreign capital in the direction of the human development oriented programmes in the country.

Olowookere, Olowo, Mabinuori and Aderemi (2021) investigated into the examining the contributions of the different components of foreign capital inflows in driving one of the key goals of sustainable development-poverty reduction in Nigeria. In achieving the objective of this study, annual data between 1990 and 2019 were utilized with the application of FMOLS and Granger causality technique of estimation. The findings of this research work are as follows; firstly, foreign capital inflows and poverty reduction have a long run equilibrium relationship in Nigeria. Furthermore, there is a unidirectional causality flowing from poverty reduction to foreign direct investment. Poverty reduction Granger causes foreign portfolio investment. Also, feedback relationship exists between poverty reduction and remittances. This implies that poverty reduction is a strong factor causing the inflows of foreign capital such as FDI, FPI and remittances in Nigeria. Moreover, the majority of the components of foreign capital inflows such as FDI, FPI and remittances contributed immensely to the reduction of poverty in Nigeria. This implies that foreign capital inflows have the capacity to propel the achievement of Sustainable Development Goal one poverty reduction in Nigeria. Therefore, this study makes the following recommendations for the policymakers in Nigeria and by extension Africa that, any time these policymakers set to achieve Sustainable Development Goal one i.e poverty reduction, foreign capital inflows such as remittances, foreign portfolio investment, FDI and external debt should be given priority in their country. And such, the policy that facilitates the sporadic inflows of these variables should be embarked upon by the Nigerian policymakers in particular and African policymakers in general.

Amaefule (2020) examines into the impact of the dynamical nature of foreign direct investment inflow and official development assistance inflow on growth and trade indicators in Ghana and Nigeria. Secondary data sourced from Word development indicators for the period covering 1970 to 2017 were utilized. The Nonlinear ARDL Bound F-test showed a long-run relationship between global capital inflow and growth and trade. Particularly, positive rise in foreign direct inflow would generate capital inflows and growth and trade. A positive rise on foreign direct investment positive impact on real gross domestic product in Ghana and a negative impact on real gross domestic product in Nigeria. It also shows that foreign direct investment in Nigeria would generate positive foreign aid causes a positive impact on real gross domestic product.

Mohamed (2020) investigated into the dynamic relationship between foreign capital inflows on economic growth of Mediterranean countries2 over the period 1980-2018 Foreign direct investment (FDI) and official development aid (ODA) were used as a main source of capital inflow in this study. A standard growth model are estimated using panel co-integration approach. In addition, both fixed-effects and random effects models were used to check for the significant of the parameters. Panel unit root are employed to check for the efficiency of the data. The long run relationship is estimated using fully modified OLS and: Panel Dynamic Least Squares (DOLS) methods. The empirical results reveal that there exist a long run co-integrating relationship between foreign aid, FDI and economic growth in Mediterranean countries. The results of FMLOS and DOLS show that FDI ODA variables are positive and have significant impact on the long run growth of the Mediterranean economy. Further, fixed –effects method is selected as random effect model is rejected based on Hausman test result. The results of fixed effect show that FDI and Foreign aid variables ate positive and statistically significant. As a policy recommendation the study, suggest that proper absorptive capacity should be met in order to attract FDI and ODA such as sound macroeconomic policies, good institutions, deep financial institution, low inflation rate and supplementing public expenditures.

Ehigiamusoe and Lean (2019) examines the impact of foreign capital inflows on economic growth in Nigeria for 1980–2015 period. It employs Autoregressive Distributed Lagged (ARDL)-bounds test, and finds a co-integration relationship between foreign capital inflows and growth. Specifically, foreign portfolio investment has positive impact on growth, while the impact of foreign loans is negative. Nevertheless, foreign direct investment and foreign aid have insignificant impact on growth, suggesting that Nigeria cannot rely on foreign direct investment and foreign aid as vehicles to stimulate growth. Rather, an increase in foreign portfolio investment or reduction in foreign loans has beneficial effects on the economy.

Lozi and Shakatreh (2019) investigated into the impact of international capital flows on the economic growth in

Jordan during the period from 2005 to 2017, the study also examines trends and composition of capital inflows. The study used descriptive analytical research method which was appropriate for the purpose of research. By using time series data, the study found that Foreign Direct Investment (FDI), foreign portfolio investment (FPI), grants (Gr) and Worker remittances (WR) are positively affecting the economic growth direct contribution. Based on the research results, the study came with a several recommendations, the most important recommendation is; the government of Jordan should create and relax the rules and regulations to attract more investors, and also the government should work hand in hand with the developed countries to create economic and employment opportunities, improve the country's competitiveness, and expand growth within the private sector so that everyone in Jordan has the opportunity to contribute to a brighter future.

Adams and Klobodu (2018) examines into the differential effects of capital flows on economic growth in five Sub-Saharan African (SSA) countries over the period 1970–2014. Using the autoregressive distributed lag methodology, the findings show that in the long-run capital flows (i.e. foreign direct investment (FDI), aid, external debt, and remittances) have different effects on economic growth. FDI has a significant positive effect in Burkina Faso and negative effects in Gabon and Niger whereas the impact of debt is negative in all countries. Aid, however, promotes growth in Niger and Gabon whiles it deters growth in Ghana. Remittances, on the other hand, have a significant positive effect in Senegal. Finally, gross capital formation is significant in most of the countries and the impact of trade is mixed. These results suggest that the benefits of capital flows in SSA have been overemphasized.

Klobodu and Adams (2016) examines into the differential effects of capital flows on economic growth in Ghana over the period 1970–2014 using autoregressive distributed lag (ARDL). Breakpoint unit root tests are employed to cater for structural change and breaks in time series. Afterwards, these break dates are fed into the ADRL model as dummy variables to allow for the computation of a more robust cointegrating vector. The findings indicate that in both the short and long run capital flows (i.e. FDI, aid, and external debt) have negative effects on economic growth. However, remittances exhibit positive insignificant elasticity in all the regressions. Further, the empirical results show that while the impact of trade, gross capital formation and population growth on growth are mixed, that of inflation is negative. The results of the study are consistent with the idea that the impact of capital flows in Africa has been exaggerated.

ur Rehman and Ahmad (2016) investigated into the effect of foreign capital inflow variables to analyze their impact on economic growth of 21 developing countries for the period of 1990 to 2013. Modern econometric techniques are applied for data analysis including panel unit root test and pooled mean group (PMG) estimation for short-run and long-run analysis. The results indicate that inflows including net external debt and net official development assistance have significantly negative impact on economic growth of developing countries, while net foreign direct investment and net remittances have positive and significant impact on economic growth in the long-run. The negative sign of error correction term shows the convergence of the variables towards equilibrium in the long-run. The study highlights the need of allocation of foreign resources effectively and efficiently.

Nwosa and Akinbobola (2016) investigated into the role of macroeconomic policies (monetary, fiscal and trade policies) in the relationship between capital inflows (proxy by foreign direct investment, foreign aid and international workers' remittances) and economic growth in Nigeria for the period 1970 to 2013. The study employed Autoregressive Distributed Lag (ARDL) Bound co-integration technique. The study found that macroeconomic policy plays a fundamental role in the relationship between capital inflows and economic growth in Nigeria.

Adamu, Kabuga and Suleiman (2015) investigated into relationship between remittances, aid, foreign direct investment, financial development and economic growth. The study employed the ARDL bounds test for co-integration using the annual time series over the period of 1977 to 2014. The findings revealed that in the short run remittance and aid have negative and statistical significant effects on growth in the country. On the other hand, Foreign Direct Investment has a positive and statistically significant effect on growth. These relationships are also true in the long run albeit not statistically significant. The study concludes that Foreign Direct Investment and financial development are important determinants of economic growth in Nigeria. These findings highlight the importance of improving financial deepening in the toolkit of Nigeria's economic policy and underpin the reasoning behind giving capital inflows a prominent role in the development strategy of the country.

3.0 METHODOLOGY

The secondary was sourced from the world development index and Central Bank statistical bulletin of 2022. The social sustainability was measured with primary school enrolment. The external financial flows was capture from external flows of foreign direct investment, remittances,

foreign aids, external debt and Net export and the internal flows were captured from the government expenditure on health, government expenditure on education. The Auto-regressive distributed lag (ARDL) model was used to draw inference after the stationary test gave the validity in other not to violate Engel Granger (1949)

Linear Representation:

$$PS_t = (\beta_0 + \beta_1 FDI_t + \beta_2 FA + \beta_3 Rem_t + \beta_4 NetE + \beta_5 ExtD_t + \beta_6 GEE + \beta_7 GEH_t + \varepsilon_t)$$

$$\Delta LPS_t = \rho\varrho_{t-1} + \sum_{i=1}^{q} \alpha_{1i}\,\Delta LPS_{t-i} + \sum_{i=0}^{q} \alpha_{2i}\,\Delta LFDI_{t-i} + \sum_{i=0}^{q} \alpha_{3i}\,\Delta LFA_{t-i} + \sum_{i=0}^{q} \alpha_{4i}\,\Delta LRem_{t-i} + \sum_{i=0}^{q} \alpha_{5i}\,\Delta LNetE_{t-i} + \sum_{i=0}^{q} \alpha_{6i}\,\Delta LExtD_{t-i} + \sum_{i=0}^{q} \alpha_{7i}\,\Delta LGEE_{t-i} + \sum_{i=0}^{q} \alpha_{8i}\,\Delta LGEH_{t-i} + \beta_1 LFDI_{t-1} + \beta_2 LFA_{t-1} + \beta_3 LRem_{t-1} + \beta_4 LNetE_{t-1} + \beta_5 LExtD_{t-1} + \beta_6 LGEE_{t-1} + \beta_7 LGEH_{t-1} + \varepsilon_t \quad (3.1)$$

The short-run model (Error-correction model):

$$\Delta LPS_t = \rho\varrho_{t-1} + \sum_{i=1}^{q} \alpha_{1i}\,\Delta LPS_{t-i} + \sum_{i=0}^{q} \alpha_{2i}\,\Delta LFDI_{t-i} + \sum_{i=0}^{q} \alpha_{3i}\,\Delta LFA_{t-i} + \sum_{i=0}^{q} \alpha_{4i}\,\Delta LRem_{t-i} + \sum_{i=0}^{q} \alpha_{5i}\,\Delta LNetE_{t-i} + \sum_{i=0}^{q} \alpha_{6i}\,\Delta LExtD_{t-i} + \sum_{i=0}^{q} \alpha_{7i}\,\Delta LGEE_{t-i} + \sum_{i=0}^{q} \alpha_{8i}\,\Delta LGEH_{t-i} + \varepsilon_t \quad (3.2)$$

The Long-run model (co-integration model):

$$\Delta LPS_t = \gamma_o + \beta_1 LFDI_{t-1} + \beta_2 LFA_{t-1} + \beta_3 LRem_{t-1} + \beta_4 LNetE_{t-1} + \beta_5 LExtD_{t-1} + \beta_6 LGEE_{t-1} + \beta_7 LGEH_{t-1} + \varepsilon_t \quad (3.3)$$

PS= primary school enrolment rate, FDI= foreign direct Investment, FA= Foreign Aid, Rem= Remittances, NetE= Net export, ExtD= External Debt, GEE= Government expenditure on Education, GEH: Government expenditure on health, $\rho\varrho_{t-1}$ is the lagged error correction term for equation 3.1-3.3 and α_1- α_7 are the short-run coefficient and β_1- β_8 are the long-run parameter for that explanatory variables, t is the time period in the inquiry, ε_t are the error term.

The Auto-regressive Distributed Lag (ARDL) approach by Pesaran, Shin, and Smith (2001) is used for testing the existence of co-integration relationship and error-correction estimation. The ARDL approach is been applied to the exogenous and endogenous variables of a different order of co-integration (Pesaran and Pesaran, 1997). This approach allows the estimation of short and long-run parameters concurrently. The short-run (error-correction model) model and the long-run model (co-integration model) of the ARDL model equation can be specified below is written as:

Description of Variables

S/N	Description	Unit	Source
1	Foreign Direct Investment (FDI)	₦' Billion	CBN Statistical Bulletin (2022)
2	Foreign Aid (FA)	US Dollars	World Development Indicators (2022)
3	Remittances (Rem)	US Dollars	World Development Indicators (2022)
4	External Debt (ExtD)	US Dollars	World Development Indicators (2022)
5	Net Export (NetE)	US Dollars	World Development Indicators (2022)
6	Government Expenditure on Health	₦' Billion	CBN Statistical Bulletin (2022)
7	Government Expenditure on Education	₦' Billion	CBN Statistical Bulletin
8	Primary School enrolment rate	Percent (rate)	World Development Indicators (2022)

Author's Compilation, 2023

4.0 RESULTS AND DISCUSSION

4.1 Descriptive Analysis

	PS	EXT_DEBT	FDI	FOR_AID	GEE	GEH	NET_EXPT	REMIT
Mean	1.955200	3.281089	3.483937	8.994511	2.160876	1.957320	6.628978	3.661185
Median	1.952970	3.212587	3.546409	9.257645	2.137101	2.010938	6.919588	3.998536
Maximum	2.009060	4.534918	4.593828	10.05812	2.596487	2.507382	7.299083	8.333830
Minimum	1.890217	2.642356	2.155943	8.181815	1.600755	1.350319	5.313048	0.118105
Std. Dev.	0.032912	0.530335	0.657173	0.577609	0.342817	0.387844	0.616041	2.252081
Skewness	-0.152258	0.630027	-0.405812	-0.126114	0.072610	-0.211088	-0.853167	0.063689
Kurtosis	2.191063	2.447183	2.371540	1.540015	1.342765	1.519025	2.563353	1.885666
Jarque-Bera	1.151793	2.445565	1.361025	2.835434	3.574708	3.063212	4.007054	1.624871
Probability	0.562201	0.294410	0.506357	0.242266	0.167403	0.216188	0.134859	0.443776
Sum	72.34241	101.7138	108.0021	278.8298	66.98715	60.67692	205.4983	113.4967
Sum Sq. Dev.	0.038996	8.437666	12.95629	10.00897	3.525710	4.512684	11.38519	152.1560

Author's Compilation, 2023

Note; PS (Primary School enrolment rate), FDI (Foreign direct investment), FA (Foreign aid), EXTD (External debt), REM (Remittances), NetE (Net export), GEE (Government expenditure on education) and GEH (Government expenditure on health).

The above table depicts the descriptive statistics used in the study. PS (Primary School enrolment rate), has a mean value of 1.95%, a median value of 1.95%, and a Standard deviation has a variation of 0.03. FDI (Foreign Direct Investment) has a mean value of 3.48%, a median value of 3.54%, and a Standard deviation has a variation of 0.65. FA (Foreign aid) has a mean value of 8.99%, a median value of 9.25%, and a Standard deviation has a variation of 0.57. REM (Remittances) has a mean value of 3.66%, a median value of 2.99%, and Standard deviation a variation of 2.25. Ext D (External Debt) has a mean value of 3.28%, a median value of 3.21%, and Standard deviation a variation of 0.53. NetE (Net export) has a mean value of 6.62%, a median value of 6.91%, and a Standard deviation of a variation of 0.61. GEH (Government expenditure on health) has a mean value of 1.95%, a median value of 2.01%, and a Standard deviation of a variation of 0.42. GEE (Government expenditure on education) has a mean value of 2.05%, a median value of 0.38%, and a Standard deviation has a variation of 0.34. TAXR (Tax revenue) has a mean value of 2.91%, a median value of 3.10%, and a Standard deviation has a variation of 0.64.

The skewness in the variable includes; PS (Primary School enrolment rate) indicates a short-tailed (negative skewness) at -0.15. FDI (Foreign Direct Investment) indicates a short-tailed (negative skewness) at -0.40. FA (Foreign aid) indicates a short-tailed (negative skewness) at -0.12. REM (Remittances) indicates a long-tailed (positive skewness) at 0.06. ExtD (External debt) indicates a long-tailed (positive skewness) at 0.63. NetE (Net export) indicates a short-tailed (positive skewness) at -0.85. GEH (Government expenditure on health) indicates a short-tailed (negative skewness) at -0.21. GEE (Government expenditure on education) indicates a positive-tailed (positive skewness) at 0.07.

The Kurtosis in the variable include: PS (Primary School enrolment rate) is leptokurtic at 2.19, since (2.19>3), FDI (Foreign Direct Investment) is leptokurtic at 2.37, since (2.37<3), FA (Foreign aid) is leptokurtic at 1.54, since (1.54<3), REM (Remittances) is leptokurtic at 1.88, since (1.88<3), ExtD (External Debt) is leptokurtic at 2.44, since (2.44<3), NetE (Net export) is leptokurtic at 2.56, since (2.56<3), GEE (Government expenditure on health) is leptokurtic at 1.51, since (1.51<3), GEE (Government expenditure on education) is leptpkurtic at 1.34, since (1.34<3), TAXR (Tax revenue) is leptokurtic at 2.12, since (2.12<3).

4.2 Correlation Matrix

The table above show is the correlation matrix table that helps to test for multicollinearity among the outcome and explanatory variables. The multicollinearity of 0.90 shows to be very high and would generate spurious results if used for any ordinary least square estimation. The above shows that the relationship between the variables in is below the threshold of 0.90. The explanatory variables of net export, foreign direct Investment, external debt and remittances has a negative relationship with PS (Primary School enrolment rate) while foreign aid and tax revenue has positive relationship with PS (Primary School enrolment rate) in Nigeria.

4.3 Unit Root Analysis

Variable	Level T-Stat	Critical Value @ 5%	First Difference T-stat	Critical Value @ 5%	Prob	Order of Integration
PS	-3.540	-3.7777	-1.9506	-3.57434	0.0007	I(I)
FDI	-1.8819	-3.56837	----------	----------	0.0013	I(0)
FA	-2.34611	-3.5875	-5.3015	-3.5806	0.0010	I(1)
REM	-2.6000	-3.5683	----------	----------	0.0000	I(0)
EXTD	-1.50601	-3.5742	-3.7468	-3.5742	0.0349	I(I)
NEtE	-1.7390	-3.5683	-5.5735	-3.5742	0.0005	I(I)
GEE	-2.6623	-3.5683	-5.8412	-3.5742	0.0002	I(I)
GEH	-1.9051	-3.5683	-6.4024	-3.5742	0.0001	I(I)

Author's Compilation, 2023

	PS	NET_EXP	GEH	GEE	FOR_AID	FDI	EX_DEBT	REMI
PS	1.000000							
NET_EXPORT	-0.367239	1.000000						
GEH	-0.456215	0.668813	1.000000					
GEE	-0.772439	0.670670	0.616078	1.000000				
FOREIGN_AID	0.289270	0.638019	0.688810	0.652149	1.000000			
FDI	-0.998311	0.683226	0.670475	0.685242	0.618368	1.000000		
EXTERNAL_DEBT	-0.489366	0.724541	0.603118	0.646547	0.541298	0.642482	1.000000	
REMITTANCES	-0.299923	0.601788	0.601117	0.715019	0.602570	0.769184	0.440442	1.000000
TAXR	0.33752	0.652798	0.689127	0.799851	0.633372	0.981283	0.889142	0.783942

Author's Compilation, 2023

The Augumented Dickey-Fuller unit root results which are a pre-estimation test, help to give direction on the actual econometrics analysis that would be suitable for drawing inferences for the outcome and explanatory variables in the model specification. The FDI (Foreign Direct Investment) and the REM (Remittances) are both stationary at level I(0). PS (Primary School enrolment rate), FA (Foreign aid), ExtD (External debt), NetE (Net export), GEE (Government expenditure on education) and GEH (Government expenditure on health) are stationary at the level I(I). Based on the order of integration of the variables, the ARDL (Auto-regressive distributed lag) technique was used to investigate both short and long-run relationships. This has to be followed, so as not to validate the position of Granger 1957, in drawing inference from faulty unit root expressions.

4.4 Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	7.443178	NA	1.43e-10	0.031818	0.387327	0.154540
1	208.4053	298.5723	6.25e-14	-7.794587	-4.595014*	-6.690095
2	305.3240	99.68782*	1.77e-14*	-9.675657*	-3.632018	-7.589393*

Author's Compilation (2023)

The table 4.4 showed different lag length criterion (LR, FPE, AIC, SIC and HQ).The Akaike information criterion depicting lag order length of (II) for the model is selected. After establishing the lag order length, the ARDL, short and long-run equation results were estimated and explained in the below.

4.5 Autoregressive Distributed Lag (ARDL)

Dependent Variable: PS

Table 4.18: Autoregressive Distributed Lag (ARDL) Estimates of Model Three

Variable	Coefficient	Std. Error	t-statistic	Prob
PS(-1)	0.626748	0.156806	3.996963	0.0004
FDI	0.002879	0.025199	0.114252	0.9099
FA	0.006035	0.020972	0.287772	0.7757
REM	0.002193	0.004407	0.497702	0.6227
NETE	-0.009983	0.027647	-0.361090	0.7208
EXTD	0.027077	0.009406	2.878768	0.0077
GEE	-0.021012	0.034814	-0.603538	0.5512
GEH	-0.004661	0.030911	-0.150797	0.8813
C	0.691228	0.297349	2.324635	0.0279
R-squared	0.6407		Mean dependent	1.9547
Adj R-squared	0.5343		S.D dependent	0.0332
F-statistic	6.0208		Durbin-Watson	1.5204
Prob(F-statistic)	0.0001			

Author's Compilation (2023)

The previous PS (-1) has positive significant effect on PS. FDI has positive insignificant effect on PS. FA has positive insignificant effect on PS. REM has positive insignificant effect on PS. NETE has negative insignificant effect on PS. ExtD has positive significant effect on PS. GEE has negative insignificant effect on PS. GEH has negative insignificant effect on PS. The Durbin Watson value of 1.5 shows low presence of serial auto-correlation among the explanatory variables in the model. The measure of the goodness of fit, R^2, shows that 64% variation in the dependent variable can be explained by the independent variable leaving 36% unexplained. The Adjusted R-square depicted that if additional variable is added to the independent variable, the independent variable will still be able to explain at 53% variation in the dependent variable .The F-statistics (6.0208) which is greater than its prob (F-statistics) 0.0001 at 5% level of significance indicated that the linear relationship between the independent and dependent variables were statistically significant.

4.6 ARDL Bound Test

The ARDL bound test is an improvement on the ARDL modelling which makes use of both F and t-statistics to test the significance of the lagged level of the variable in a uni-variate equilibrium correction system when it is difficult to ascertain whether the time series data is trend or first difference stationary. ARDL Bound test helps to ascertain whether there is long-run co-integration relationship between the dependent variable PS and the independent variables FDI, FA, REM, EXTD, NETE, GEE and GEH

Bound Test Result

t-statistics	Value	K	I(0)	I(1)
F-statistics	11.74759	7	2.32	3.5

Bound test at 5% level of significance

The table 4.6 above revealed the bound test result. The result of the F-statistics value which is 11.74759 is higher than the lower bound and the upper bound values of 2.32 and 3.5 respectively at 5% level of significance. This implies that there is a long-run relationship among the variables was accepted and the alternative hypothesis was rejected. Therefore, there is a long-run co-integration among the variables.

Table 4.6.1: Co-integration Form

Variable	Coefficient	Std-Error	t-Statistic	Prob
D(FDI)	0.002879	0.025199	0.114252	0.9099
D(FA)	0.006035	0.020972	0.287772	0.7757
D(REM)	0.002193	0.004407	0.497702	0.6227
D(NETE)	-0.009983	0.027647	-0.361090	0.7208
D(EXTD)	0.027077	0.009406	2.878768	0.0077
D(GEE)	-0.021012	0.034814	-0.603538	0.5512
D(GEH)	-0.004661	0.030911	-0.150797	0.8813
ECM(-1)	-0.373252	0.156806	-2.380341	0.0246

Author's Compilation (2023)

The Table 4.6.1 explained the short-run relationship between financial flows, expansionary fiscal measures and primary school enrolment rate in Nigeria. The results shows that the speed of adjustment from an earlier disturbance away from the long run identified by the CointEq(-1) is negative and significant with a coefficient estimate of -0.3732. The value of the error correction term is -0.3732 depicts the deviation from the long-run equilibrium in one year is corrected by 37%. These outcomes further validates the presence of long-run relationship among the variables in the model. At the speed of adjustment of 37%, there is a short-run relationship among external financial flows, fiscal policy and primary school enrolment rate.

Table 4.6.2: Long run Coefficients

Variable	Coefficient	Std-Error	t-Statistic	Prob
FDI	0.007713	0.068651	0.112355	0.9114
FA	0.016169	0.054899	0.294532	0.7706
REM	0.005877	0.012473	0.471163	0.0413
NETE	-0.026746	0.078805	-0.339390	0.7369
EXTD	0.072544	0.035373	2.050811	0.0201
GEE	-0.056293	0.082971	-0.678474	0.0032
GEH	-0.012488	0.084720	-0.147408	0.8839
C	1.851907	0.490849	3.772865	0.0008

Author's Compilation (2023)

The Table 4.21 above reveals the long-run relationship between financial flows, expansionary fiscal measures and primary school enrolment rate in Nigeria. Foreign direct investment has a positive insignificant effect on primary school enrolment rate in Nigeria. Foreign aid has a positive insignificant effect on primary school enrolment rate in Nigeria. Remittances has a positive significant effect on primary school enrolment rate in Nigeria. Net export has a negative insignificant effect on primary school enrolment rate in Nigeria. ExtD has a positive significant effect on primary school enrolment rate in Nigeria. Government expenditure on education has a negative significant effect on primary school enrolment rate in Nigeria. Government expenditure on health has a negative insignificant effect on primary school enrolment rate in Nigeria.

In terms of magnitude, the interpretation is important due to the fact that the model is a log-log model, in such cases the functional form should be considered (Asteriou & Hall, 2011). A percentage increase in foreign direct investment will lead to 0.00 unit increase in primary school enrolment rate. A percentage increase in foreign aid will lead to 0.01 unit increase in primary school enrolment rate. A percentage increase in remittances will lead to 0.00 unit increase in primary school enrolment rate. A percentage increase in net export will lead to -0.02 unit decrease in primary school enrolment rate. A percentage increase in external debt will lead to 0.07 unit increase in primary school enrolment rate. A percentage increase in government expenditure on education will lead to -0.05 unit decrease in primary school enrolment rate. A percentage increase in government expenditure on health will lead to -0.01 unit decrease in primary school enrolment rate.

Table 4.6.3: Diagnostic Test for Financial flows and Social Sustainability IN Nigeria

Test	Value	Prob
Jarque-Bera Normality Test	2.0648	0.3561
Serial Correlation LM Test	8.1780	0.8117
Breausch-Pagan-Godfrey Heteroskedasticity Test	0.3604	0.9177

Author's Compilation (2023)

The diagnostic test conducted includes the Jarque-Bera Normality test, Serial correlation LM Test and Breausch-Pagan-Godfrey Heteroskedasticity Test to ensure the model is in tandem with respective econometric properties. The Table 4.6.3 above depicts the Jarque-Bera Normality Test shows an insignificant results, indicating that the residual of the regression estimate was distributed normally. The F-statistics value obtained from the serial correlation LM Test and heteroskedasticity test were insignificant, depicting that no presence of serial autocorrelation and heteroskedasticity in the regression estimate residual. The conclusion of this findings is that the model were estimated correctly.

Stability Test

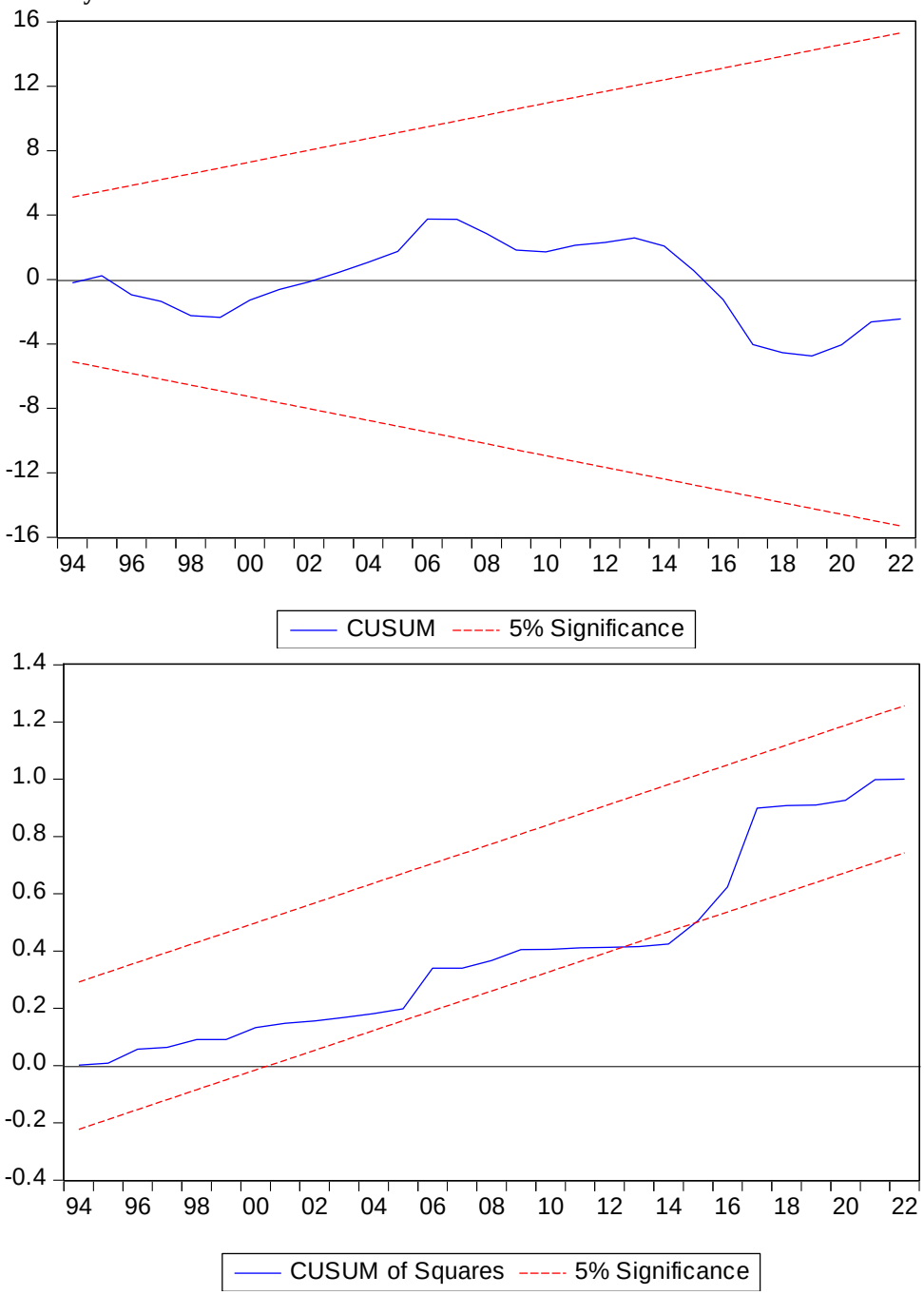


Figure 1: Stability Test (CUSUM) Test and (CUSUM) of Squares test

The stability test results showed that the model estimates were within the critical boundaries of a 5% level of significance. The results employs that the model is dynamically stable and the inference drawn from it are reliable for policy formulation.

5.0 CONCLUSION AND RECOMMENDATION

The findings revealed that remittances and external debt has a positive significant effect on primary school enrolment rate while government expenditure on education has a negative significant effect on primary school enrolment rate in Nigeria. This suggests that financial inflows from remittances and external borrowing provide critical resources that facilitate access to primary education, potentially by alleviating household financial constraints and enabling investments in educational infrastructure. Conversely, government expenditure on education is found to have a negative and significant effect on primary school enrollment rates. This counterintuitive result may indicate inefficiencies in the allocation or utilization of educational funds, such as mismanagement, corruption, or a misalignment between government spending priorities and the actual needs of the educational sector. These findings highlight the complex dynamics of education financing in Nigeria and underscore the need for more effective policy interventions that not only increase access to funding but also ensure that these funds are used efficiently to improve educational outcomes. Addressing the inefficiencies in government spending could be crucial in reversing the negative impact on enrollment rates and achieving the desired educational goals in Nigeria. The findings above agree with the work of Olowookere et al (2021), that remittances and external debt are inflows that can help in the reduction of poverty level in Nigeria, niching on the ideology that increase in primary school enrolment would aid the reduction of poverty level, because it would aid the literacy level of populace and them been employable in the economy. The study also agree with the works of Ur Rehman & Ahmed (2016), Klobodu & Adam (2016), Adam & Klobodu (2018) and Lozi & Shakatreh (2019). Particularly, the works of Nwosa & Akinbobola (2016) indicates the importance of government expenditure on education has a tool in improving the educational sector in the economy which is a holistic view of the educational sector. Based on the above findings the government should consider leveraging the positive impact of remittances and external debt by creating policies that facilitate the flow of remittances and ensure that external borrowing is directed towards improving educational infrastructure and access. For example, remittance programs could be incentivized by reducing transaction costs, making it easier for families to receive funds that could support their children's education. Notably, the negative impact of government expenditure on education suggests a need for a thorough review of how educational funds are allocated and spent. The government should prioritize transparency and accountability in the education sector, ensuring that funds are efficiently used for their intended purpose, such as improving school facilities, providing learning materials, and training teachers. Additionally, the government could engage in public-private partnerships to enhance the efficiency and effectiveness of educational spending. By collaborating with private organizations, the government can draw on additional resources and expertise to address gaps in the education system. Finally, regular monitoring and evaluation should be implemented to assess the impact of educational spending and adjust policies as needed to ensure that they contribute positively to primary school enrollment rates.

REFERENCES

Adams, S., & Klobodu, E. K. M. (2018). Capital flows and economic growth revisited: evidence from five Sub-Saharan African countries. *International Review of Applied Economics*, *32*(5), 620-640.

Adamu, A. M., Kabuga, N. A., & Suleiman, H. H. (2015). Remittance, aid, foreign direct investment, financial development and economic growth in Nigeria: a time series analysis. In *Proceedings of 1st international conference and doctoral colloquium on the theme:"development in africa: perspectives, issues and trends", faculty of social and management sciences, Bayero University Kano, Nigeria held between 17th–18th November*.

Aliedan, M. M. (2021). The impact of international trade on sustainable development in Saudi Arabia. *Croatian International Relations Review*, *27*(88), 74-95.

Amaefule, C. (2020). Global capital inflows, growth, and trade indicators in Ghana and Nigeria: Evidence from asymmetric co-integration framework. *European Journal of Sustainable Development Research*, *4*(4), em0130.

Asongu, S., & Nnanna, J. (2019). Foreign aid and sustainable inclusive human development in Africa. *DBN Journal of Economics and Sustainable Growth*, *1*(2), 1-29.

Ayamba, E. C., Haibo, C., Abdul-Rahaman, A. R., Serwaa, O. E., & Osei-Agyemang, A. (2020). The impact of foreign direct investment on sustainable development in China. *Environmental Science and Pollution Research*, *27*, 25625-25637.

Bamidele, M. I., Elumah, L. O., & Adelowokan, O. A. (2022). Financial Development and Poverty Alleviation in Nigeria. *African Development Finance Journal*, *4*(1), 119-139.

Ehigiamusoe, K. U., & Lean, H. H. (2019). Foreign capital inflows and economic growth in Nigeria: any nexus?. *Journal of African Business*, *20*(4), 455-471.

Idris, M. (2019). Relative impact of monetary and fiscal policy on output growth in a small-open economy. *American Research Journal of Humanities & Social Science (ARJHSS)*, *2*(08), 26-38.

Klobodu, E. K. M., & Adams, S. (2016). Capital flows and economic growth in Ghana. *Journal of African Business*, *17*(3), 291-307.

Lozi, B. M., & Shakatreh, M. (2019). The impact of international capital flows on Jordan's economic growth. *International Journal of Economics and Financial Research*, *5*(9), 214-220.

Mohamed, S. E. (2020). The Dynamic Effects of Capital Inflows on Economic Growth of the Mediterranean Countries: Panel Co-integration Approach.

Nenbee, S. G., & Danielle, I. E. (2021). Primary school enrolment, public spending on education and economic growth in Nigeria. *Mediterranean Journal of Social Sciences*, *12*(5), 103- 103.

Nwosa, P. I., & Akinbobola, T. O. (2016). Capital Inflows and economic growth in Nigeria: the role of macroeconomic policies. *African Development Review*, *28*(3), 277-290.

Oloke, E., Olabisi, F., Johnson, A. A., Awofala, H. T., & Aderemi, T. A. (2022). Nexus between Foreign Capital Inflows and Human Capital Development in Nigeria. *EuroEconomica*, *41*(2).

Olowookere, J. K., Olowo, S. O., Mabinuori, O. T., & Aderemi, T. A. (2021). Foreign capital inflows and poverty reduction in Nigeria: An implication for sustainable development. *EuroEconomica*, *40*(1).

Onyekwelu, O. V. (2022). International Capital Inflows and Human Capital Development in Nigeria (1988-2020). *International Journal of Innovative Development and Policy Studies*, *10*(2), 59-70.

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2020). The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020. Cambridge: Cambridge University Press.

SOS (2022). *6 Causes of Poverty in Africa*. sos.usa.org

ur Rehman, S., & Ahmad, H. K. (2016). THE IMPACT OF FOREIGN CAPITAL INFLOWS ON ECONOMIC GROWTH. *Pakistan Economic and Social Review*, *54*(2), 191-203.

Voica, M. C., Panait, M., and Haralambie, G. A. (2015). The Impact of Foreign Direct Investment on Sustainable Development. *Petroleum-Gas University of Ploiesti Bulletin, Technical Series*, *67*(3).

World Bank (2020). World development indicators & global development finance; 2010. Available:http://data.worldbank.org/datacatalog/ world-development-indicators/wdi-

World Bank in Nigeria (2022). Nigeria Poverty Assessment 2022: A better Future for All Nigerians

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

WORK-FAMILY INTERFACE AMONG DUAL-CAREER COUPLES: A COMPARATIVE STUDY OF NIGERIAN COUPLES IN ACADEMIA AND HEALTHCARE

Okoliko Emmanuel Ojonugwa
Department of Business Administration, National Open University of Nigeria, Abuja
Corresponding Author: Email eokoliko@noun.edu.ng

ABSTRACT

Interest in the subject of how dual-career couples handle work and family has grown over the years. This study looked at how dual-career couples in Nigeria's academic and medical fields interacted with their families and work. Data collection from the participants employed a mixed-methods research design in this study This included both qualitative and quantitative data collection techniques. One hundred participants were selected from the academic and medical fields using purposeful sampling method. According to the inclusion criteria, the sample was composed of dual-career couples who had at least a child under 18 years of age living with them. Self-administered questionnaires about the participants' job satisfaction, well-being, and work-family interface were used to collect the quantitative data. While to gather qualitative data on the participants' experiences and perceptions of their work-family interface, in-depth interviews were conducted. Thematic analysis was used to analyze the qualitative data while descriptive and inferential statistics like t-tests and ANOVA were used to analyze the quantitative data. Couples in academia faced issues with workload and time commitments, whereas those in healthcare dealt with issues of work-family conflict and the emotional demands of their jobs. This study's conclusions have both theory and practical implications. Therefore, it is recommended that dual-career couples in academia and healthcare use a variety of coping mechanisms, such as; effective communication, shared decision-making, boundary-setting, seeking social support, and utilizing available workplace policies and mechanisms to manage the work-family interface.

Key words: *Dual-career couples, Work-family interface, work-family interface challenges, Role overload, Role conflict*

1.0 INTRODUCTION

In the global workforce, the work-family balance for dual-career couples is a subject that is receiving more and more attention. Couples with dual careers struggle to juggle work and family obligations because both partners are pursuing careers. It has been discovered that the work-family interface affects people's wellbeing, job satisfaction, and organizational outcomes. In recent years, there has been an increase in the proportion of couples with two careers, not just in Nigeria but in many other nations as well. This trend is driven by the rise of women in the workforce, changes in family structures, and increased access to education and employment opportunities.

Dual-career couples may find it difficult to balance their work and family obligations, especially in environments where such a goal may not receive much support. For example, cultural expectations regarding gender roles and caregiving responsibilities may exist in Nigeria, which may add to the difficulties faced by dual-career couples. The rise of women in the workforce, modifications to family structures, and improved access to education and employment opportunities are just a few of the factors that are fueling this trend.

In order to identify common problems and potential solutions, the study examines how dual-career couples in the fields of academia and healthcare balance work and family. The study compares these two fields in an effort to shed light on how work-family balance may vary depending on the profession. Overall, the study advances knowledge of how work and family interact in Nigeria and offers guidance to individuals, employers, and policymakers who want to support work-family balance.

Research indicates that the work-family interface can affect individual outcomes such as mental health, job satisfaction, and overall life satisfaction (Frone et al., 1992). Despite this growing body of literature, much of the research has been conducted in Western contexts, highlighting a gap in understanding how these dynamics play out in non-Western settings, particularly in Africa (Nwachukwu et al., 2020). Further research in this area is necessary to address this gap and inform policies and practices that support dual-career couples in these fields. This study looks at how dual-career couples in these two fields balance work and family.

The primary objective of this study is to examine the work-family interface among dual-career couples in Nigeria. Specifically, we aim to:

To investigate the negative impact of Work-family interface challenges on the well-being of dual-career couples in academia and healthcare.

To investigate the negative impact of Work-family interface challenges on the job satisfaction of dual-career couples in academia and healthcare.

To explore the extent to which the work-family interface challenges faced by dual-career couples in academia differ from those in healthcare in Nigeria

Hypothesis

H01: Work-family interface challenges does not have any negatively impact on the well-being and job satisfaction of dual-career couples in academia and healthcare.

HO2: There is no significant difference between the work-family interface challenges faced by dual-career couples in academia and those in healthcare in Nigeria

Conceptual Clarifications

Dual-Career Couples

Dual-career couples are defined as couples in which both partners are pursuing careers and earning incomes, often with shared commitments to professional advancement (Adegoke & Aluko, 2019). The prevalence of dual-career couples has increased in recent years, influenced by factors such as the rise of women in the workforce and shifting gender roles (Adebayo et al., 2019). These couples frequently encounter unique challenges in balancing professional and personal responsibilities.

Work-Family Interface

The work-family interface refers to the relationship between an individual's work life and their family or personal life, encompassing both conflict and facilitation (Greenhaus & Beutell, 1985). Work-family conflict occurs when work demands hinder family obligations or vice versa, leading to stress and negative outcomes (Frone et al., 1992). Conversely, work-family facilitation happens when experiences in one domain positively impact the other, promoting overall well-being (Carlson et al., 2000). Understanding this interface is crucial for achieving work-life balance and enhancing individual well-being.

Work-Family Interface Challenges

Challenges within the work-family interface include time management issues, role conflict, role overload, lack of support, gender inequalities, and cultural expectations (Allen et al., 2000). These challenges can lead to significant stress and burnout, particularly for dual-career couples who may struggle with competing demands on their time and energy (Kahn et al., 1964). Addressing these challenges requires both individual-level strategies, such as time management techniques, and organizational-level policies, including flexible work arrangements (Kossek & Ozeki, 1998).

2.0 REVIEW OF LITERATURES

According to a study on the coping strategies used by dual-career couples in Nigeria to address work-family conflict, by Akinola et al. (2019), the most often employed coping techniques were assigning chores to others, negotiating with employers, and getting social support from friends and family. It has been discovered that these coping mechanisms help dual-career couples feel better overall and minimize work-family conflict. The study also emphasized how crucial organizational flexibility and assistance are in assisting staff members in striking a balance between their obligations to their families and their jobs. In their 2018 study, "Marriage satisfaction and work-family conflict among Nigerian couples with two careers," Olumide et al. looked into the connection between these two factors for couples in Nigeria who are dual-career couples. The study found that women were more likely than males to suffer work-family conflict and that it had a negative effect on marital satisfaction. Researchers discovered that greater levels of marital satisfaction were reported by couples who received help from their companies in resolving work-family conflict. The report also suggested that initiatives and regulations be put in place to support dual-career spouses in Nigeria in finding a work-life balance.

Adelaiye (2021) conducted a research to look at the connection between organizational commitment and work-family conflict among academic staff in Nigerian institutions. The study discovered that work-family conflict had a detrimental effect on organizational commitment and that academic staff members who were female were more likely than those who were male to encounter it. Adelaiye found that the level of organizational support and flexibility in work schedules played a significant role in mitigating work-family conflict among academic staff. These findings suggest the importance of implementing supportive policies and practices to improve organizational commitment and work-life balance in academic institutions.

The relationship between work-family conflict and job satisfaction among Nigerian healthcare workers was also evaluated by Adelaiye et al in 2021. The study discovered that work-family conflict had a detrimental

effect on job satisfaction and that it was more common among female healthcare professionals than male healthcare professionals.

In 2019, Adebayo et al. investigated the mediation function of social support in the connection between work-family conflict and job satisfaction among dual-career couples in Nigeria. The study discovered that job satisfaction was adversely affected by work-family conflict, and that social support worked as a partial mediating factor in this connection. Furthermore, the research highlighted the importance of social support in mitigating the negative impact of work-family conflict on job satisfaction for dual-career couples. This suggests that interventions aimed at enhancing social support could potentially improve job satisfaction in this population.

Work-family conflict's effect on Nigerian female nurses' job performance was examined by Alabi et al. in 2019. The study discovered that job performance was adversely affected by work-family conflict, and that this link was mediated by social support. This implies that providing resources and programs to strengthen social support networks for dual-career couples could ultimately lead to improved job performance among Nigerian female nurses.

Ogunfowora et al.'s 2019 study examined the impact of family-friendly laws on dual-career couples in Nigeria's link between professional satisfaction and the work-family interface. The study discovered that family-friendly policies mediated the association between career satisfaction and the work-family interface, meaning that among individuals with access to family-friendly policies, the detrimental effects of work-family conflict on career satisfaction were less pronounced.

The association between work-family conflict and psychological well-being among Nigerian dual-career couples was investigated by Nwachukwu et al. (2020) in their study on the subject. The results of the study showed that psychological well-being was adversely affected by work-family conflict, but that this link was mediated by social support.

Resilience's moderating effect in the link between work-family interaction and employee well-being among Nigerian dual-career couples was assessed by Ajayi et al. (2018). Resilience was found to mitigate the detrimental effects of work-family conflict on workers' well-being.

Adewuyi et al. (2018) looked at the self-efficacy, work-family conflict, and job satisfaction as determinants of organizational commitment among Nigerian health workers. According to the study, self-efficacy, work-family conflict, and job satisfaction all strongly predicted organizational commitment.

The coping mechanisms employed by Nigerian female nurses in Lagos State to handle work-family conflict were examined by Adegoke et al. in 2019. According to the survey, prioritizing, using support networks, and time management were the most often employed coping mechanisms.

Amoo et al. (2019) investigated the connection between burnout and work-family conflict in Nigerian female teachers in Osun State. According to the study, burnout was substantially predicted by work-family conflict.

These studies shed light on how dual-career couples in Nigeria manage work and home, especially in the fields of academia and healthcare. They draw attention to the detrimental effects of work-family conflict on a range of facets of people's life as well as the coping mechanisms employed to address it.

3.0 METHODOLOGY

This comparative study aimed to examine the work-family interface among Nigerian dual-career couples in academia and healthcare and identify any differences or similarities between the two fields employing both quantitative and qualitative research methods, including surveys and interviews with participants. A mixed-methods research design was used to gather data from the participants. A purposive sampling technique will be employed to select fifty participants each from academia and healthcare fields in Nigeria, based on criteria such as age, gender, years of experience, and family structure. Data will be collected through self-administered questionnaires and in-depth interviews, designed to capture quantitative and qualitative aspects of the work-family interface. The sample size was chosen to ensure sufficient representation and diversity within each group.

The inclusion criteria will be dual-career couples with at least one child under the age of 18 living with them.

Data were collected through self-administered questionnaires and in-depth interviews designed to capture quantitative and qualitative aspects of the work-family interface. In-depth interviews were conducted to collect qualitative data on the participants' experiences and perceptions of their work-family interface.

The quantitative data were analyzed using descriptive and inferential statistics such as t-tests and ANOVA. While qualitative data were analyzed using thematic analysis.

4.0 RESULTS AND INTERPRETATION

Table 1 shows the demographic information of the respondents. 56% of the respondents are male while 44% of the respondents are female. 5% of the respondents are under 25 years old, 19% of the respondents are between 25-34 years old, 38% of the respondents are between 35-44 years, 27% of the respondents are between 45-54 years old while 11% of the respondents are over 55 years old. 13% of the respondents are less than 1 year on their job, 16% of the respondents are 1-3 years on their job, 28% of the respondents are 4-7 years on their job, 25% of the respondents are 8-10 years on their job while 18% of the respondents are more than 10 years on their job. 4% of the respondents spend less than 20 hours, 10% of the respondents spend 21-40 hours, 27% of the respondents spend 41-60 hours, 53% of the respondents spend 61-80 hours while more than 80 hours. This implies that most of the respondents spend 61-80 hours on their job. 17% of the respondents have no children, 8% of the respondents have one child, 40% of the respondents have two children while 35% of the respondents have three or more children

Table 1: Gender

		Frequency	Percent	Percent
Valid	Male	56	56.0	56.0
	Female	44	44.0	44.0
	Total	100	100.0	100.0

Demographic information		Frequency	Percentage (%)	Valid Percent	Cumulative %
Age (years)	< 25 years	5	5.0	5.0	5.0
	25-34 years	19	19.0	19.0	24.0
	35-44 years	38	38.0	38.0	62.0
	45-54 years	27	27.0	27.0	89.0
	> 55 years	11	11.0	11.0	100.0
	Total	100	100	100	
Occupation	Academic	50	50.0	50.0	50.0
	Healthcare	50	50.0	50.0	100.0
	Total	100	100	100	
Number of children	None	17	17.0	17.0	17.0
	One	8	8.0	8.0	25.0
	Two	40	40.0	40.0	65.0
	Three or more	35	35.0	35.0	100.0
	Total	100	100.0	100.0	
Work experience	< 1 year	13	13.0	13.0	13.0
	1-3 years	16	16.0	16.0	29.0
	4-7 years	28	28.0	28.0	57.0
	8-10 years	25	25.0	25.0	82.0
	> 10 years	18	18.0	18.0	100.0
	Total	100	100.0	100.0	
Work hours per week	< 20 hours	4	4.0	4.0	4.0
	21-40 hours	10	10.0	10.0	14.0
	41-60 hours	27	27.0	27.0	41.0
	61-80 hours	53	53.0	53.0	94.0
	> 80 hours	6	6.0	6.0	100.0
	Total	100	100	100	

Table 2: How do you and your partner divide household responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Division of household responsibility	Equally	53	53.0	53.0	53.0
	Mostly me	10	10.0	10.0	63.0
	Mostly my partner	24	24.0	24.0	87.0
	My partner does most of the household responsibilities	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 3 shows that 53% of the respondents divide household responsibilities with their partner, 10% of the respondents mostly do their household responsibilities themselves, 24% of the respondents have their partner mostly doing household responsibilities while 13% of the respondents agreed that their partner does most of the household responsibilities. This implies that majority of the respondents divide household responsibilities with their partner.

Table 3: How do you and your partner divide childcare responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Division of childcare responsibilities	Equally	12	12.0	12.0	12.0
	Mostly me	12	12.0	12.0	24.0
	Mostly my partner	44	44.0	44.0	68.0
	My partner does most of the childcare responsibilities	32	32.0	32.0	100.0
	Total	100	100.0	100.0	

Table 4 shows that 44% of the respondents have childcare responsibilities carried out mostly by their partner while 12% of the respondents have childcare responsibilities mostly carried by the respondents and done equally by the couples. This suggests that most of the respondents childcare responsibilities carried out mostly by their partner since Table 1 shows that majority of the respondents are male.

Table 4: Do you or your partner have any family members who provide childcare support?

		Frequency	Percent	Valid Percent	Cumulative Percent
Childcare from family members	Yes	69	69.0	69.0	69.0
	No	31	31.0	31.0	100.0
	Total	100	100.0	100.0	

Table 5 shows that 69% of the respondents agreed that they have family members who provide childcare support while 31% of the respondents don't have family members who provide childcare support for them. This implies that most of the respondents have childcare support.

Table 5: How often do you feel conflicted between your work and family responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Work-family conflicts	Never	21	21.0	21.0	21.0
	Rarely	16	16.0	16.0	37.0
	Sometimes	24	24.0	24.0	61.0
	Often	23	23.0	23.0	84.0
	Always	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 6 shows that with a combined percentage of 39%, 39 of the respondents often and always feel conflicted between their work and family responsibilities, with a combined percentage of 37%, 37 of the respondents never and rarely feel conflicted between their work and family responsibilities while 24% of the respondents sometimes feel conflicted between their work and family responsibilities. This implies that most of the respondents often and always feel conflicted between their work and family responsibilities.

Table 6: How satisfied are you with your work-family balance?

		Frequency	Percent	Valid Percent	Cumulative Percent
work-family balance satifaction	Very satisfied	22	22.0	22.0	22.0
	Satisfied	41	41.0	41.0	63.0
	Neutral	17	17.0	17.0	80.0
	Dissatisfied	12	12.0	12.0	92.0
	Very dissatisfied	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

Table 6 shows that 63% of the respondents were both satisfied and very satisfied with their work-family balance, 20% of the respondents were both dissatisfied and very dissatisfied with their work-family balance while 17% of the respondents were neutral. This implies that majority of the respondents are satisfied with their work-family balance.

Table 7: How satisfied are you with your current job?

		Frequency	Percent	Valid Percent	Cumulative Percent
Job satisfaction	Very satisfied	36	36.0	36.0	36.0
	Satisfied	32	32.0	32.0	68.0
	Neutral	13	13.0	13.0	81.0
	Dissatisfied	13	13.0	13.0	94.0
	Very dissatisfied	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 7 shows that 68% of the respondents are satisfied with their current job, 19% of the respondents are dissatisfied with their current job while 13% of the respondents are neutral. This implies that majority of the respondents are satisfied with their current job.

Table 8: Have you ever considered leaving your job due to family responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	42.0	42.0	42.0
	No	58	58.0	58.0	100.0
	Total	100	100.0	100.0	

Table 9 shows that 42% of the respondents have considered leaving their job due to family responsibilities while 58% of the have never considered leaving their job due to family. This implies that majority of the respondents disagreed that they have ever considered leaving their job due to family responsibilities.

Table 9: Do you feel that your gender affects your ability to balance work and family responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	37	37.0	37.0	37.0
	No	63	63.0	63.0	100.0
	Total	100	100.0	100.0	

Table 9 shows that 37% of the respondents feel that their gender affects their ability to balance work and family responsibilities while 63% of the respondents feels that their ability to balance work and family responsibilities is not affected by their gender. This implies that majority of the respondents agreed that their gender does not affect their work and family responsibilities.

Table 10: Do you think there should be more support for dual-career couples in the workplace?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	63	63.0	63.0	63.0
	No	37	37.0	37.0	100.0
	Total	100	100.0	100.0	

Table 10 shows that 63% of the respondents think there should be more support for dual-career couples in the workplace while 37% of the respondents think there shouldn't be more support for dual-career couples in the workplace. This implies that most of the respondents agreed that there should be more support or dual-career couples in the workplace.

Table 11: How often do you feel guilty about neglecting either your work or family responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	41	41.0	41.0	41.0
	Rarely	20	20.0	20.0	61.0
	Sometimes	14	14.0	14.0	75.0
	Often	12	12.0	12.0	87.0
	Always	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 11 shows that 61% of the respondents never or rarely feel guilty about neglecting either their work or family responsibilities, 25% of the respondents often or always feel guilty about neglecting either their work or family responsibilities while 14% of the respondents sometimes feel guilty. This suggests that most of the respondents rarely feel guilty for neglecting either work or family responsibilities, this may be due to the fact that they rarely neglect their work or family responsibilities.

Table 12: How often do you feel stressed or overwhelmed by the demands of balancing work and family responsibilities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	16	16.0	16.0	16.0
	Rarely	10	10.0	10.0	26.0
	Sometimes	42	42.0	42.0	68.0
	Often	15	15.0	15.0	83.0
	Always	17	17.0	17.0	100.0
	Total	100	100.0	100.0	

According to Table 12, 26% of respondents said they were never or seldom ever stressed out or overwhelmed by the pressures of juggling work and family obligations, 32% of the respondents often or always feel stressed or overwhelmed while 42% of the respondents sometimes feel stressed or overwhelmed. This implies that majority of the respondents were undecided about whether they feel stressed or overwhelmed by the demand of balancing work and family responsibilities.

Hypotheses Testing Using ANOVA

ANOVA is also a statistical technique use to check for the significance of relationship among variables. This is also referred to as the T tests an analysis that compares the variance between different groups with the variability within each of the groups.

Hypothesis One

H01: Work-family interface challenges does not have any negative impact on the well-being and job satisfaction of dual-career couples in academia and healthcare.

Table 13 Levene Statistic 1

Levene Statistic	df1	df2	Sig.
63.719	4	841	.080

Table 13 shows the test of homogeneity of variances on the impact of difficulties with work-family interface on the health and job satisfaction of dual-career spouses in academia and healthcare. We have the levene statistic test to be 63.719 which gave a moderate increase in the df2 (841). However, the level of significance is said to be negative since the sig <0.05.

Table 14: ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	507.716	4	126.929	376.163	.071
Within Groups	283.780	109	.337		
Total	791.495	120			

In table 18 above, the F ratio and the large F ratio which was sorted out having values between groups and between groups. Hence we have a mean square of 126.929 and a total F test of 376.163 the accuracy of the above result or given value is based on the sig. value which must be less than 0.05 for the variables to be significantly related. However, for this hypothesis, there is a negative relationship between work-family interface challenges and well-being & job satisfaction of dual-career couples in academia and healthcare. Hence, we accept the null hypothesis that states that work-family interface challenges does not have any negative impact on the well-being and job satisfaction of dual-career couples in academia and healthcare.

Hypothesis Two

HO2: There is no significant difference between the work-family interface challenges faced by dual-career couples in academia and those in healthcare in Nigeria

Table 15 Levene Statistic 2

Levene Statistic	df1	df2	Sig.
208.621	4	841	.000

Table 15 shows the test of Homogeneity of variances on the work-family interface challenges faced by dual-career couples in academia and those in healthcare. We have the levene statistic test to be 208.621 which gave a moderate increase in the df2 (841). However, the level of significance is said to be significance since the sig <0.05.

Table 16 ANOVA 2

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	763.966	4	190.991	857.673	.000
Within Groups	187.279	109	.223		
Total	951.245	120			

In Table 16, the F ratio and the large F ratio which was sorted out having values between groups and between groups. Hence we have a mean square of 190.991 and a total F test of 857.673 the accuracy of the above result or given value is based on the sig value which must be less than 0.05 for the variables to be significantly related. However, for this hypothesis, there is a high significant relationship between the variables having sig value to be .000. Hence, we reject the null hypothesis that says that there is no significant difference between the work-family interface challenges faced by dual-career couples in academia and those in healthcare in Nigeria.

5.0 DISCUSSION OF FINDINGS

The findings of this comparative study on the work-family interface among dual-career couples in Nigeria's academia and healthcare fields revealed notable differences and similarities between the two professions. Couples in academia reported facing challenges related to heavy workloads and time commitments, often feeling overwhelmed by the demands of their jobs. This aligns with previous studies that indicate high job demands in academic settings can lead to increased work-family conflict (Adebayo et al., 2019). In contrast, healthcare couples grappled with emotional demands and work-family conflicts stemming from the nature of their jobs, consistent with research showing that healthcare professionals frequently experience higher stress levels due to the emotional labor involved in their roles (Adelaiye & Olugbenga, 2021).The study identified various coping mechanisms employed by couples to manage their work-family interface, including effective communication, shared decision-making, and seeking social support. This is in line with findings from Akinola et al. (2020), which emphasize the importance of social support in mitigating work-family conflict. The research also revealed that traditional gender roles influenced the distribution of household and childcare responsibilities, with many respondents indicating that their partners primarily handled these tasks. This supports the findings of Nwachukwu et al. (2020), which highlight how gender expectations can exacerbate work-family conflict, particularly for women.

The study contributes to the growing body of literature on the work-family interface, particularly in non-Western contexts. While much of the existing research has focused on Western dual-career couples, this study fills a critical gap by examining Nigerian couples, thereby offering a broader perspective on how cultural and societal factors shape work-family dynamics. The findings indicate that work-family conflict negatively affects job satisfaction and well-being among dual-career couples (Adebayo et al., 2019; Ogunfowora & Idemudia, 2019), consistent with prior studies. The coping strategies identified in this study also resonate with those documented in earlier research, where couples reported using communication and social support as key mechanisms to navigate their challenges (Amoo & Oladejo, 2019).

However, the study differs from existing work in its approach to dual-career couples. Unlike many studies that treat dual-career couples as a homogeneous group, this research highlights the distinct challenges faced by couples in academia versus healthcare. The emphasis on cultural expectations in Nigeria adds a unique dimension to the findings, as the cultural context, where traditional gender roles are more pronounced, may lead to different experiences and coping mechanisms among dual-career couples compared to those in more egalitarian societies.

Future research should expand the sample to include diverse demographics, such as couples from different socioeconomic backgrounds, regions, and industries, to gain a comprehensive understanding of the work-family interface across Nigeria.

6.0 CONCLUSION AND RECOMMENDATION

The findings of the study showed that majority of the respondents are satisfied with their current jobs despite the work-family interface challenges faced by dual-career couples though, most of the respondents have family members who provide childcare support and a larger percentage of the respondents disagreed that they have ever considered leaving their job due to family responsibilities. The study found out that issues like workload overload and time constraints may affect both academia and healthcare, however, sector-specific issues arise. For instance, Challenges prevalent in the academia relate to teaching, research and administration while

issues including unpredictable work schedules, emotionally taxing employment, and heavy patient care obligations are common in the healthcare industry.

By offering a localized understanding of the work-family interaction, the comparative analysis of dual-career couples in Nigerian academia and healthcare will fill a gap in the body of existing knowledge. It will add to the corpus of knowledge by highlighting industry-specific difficulties and methods for juggling responsibilities to one's family and career. In the end, this study's findings will guide laws and procedures that advance people's happiness and well-being.

Therefore, it is recommended that dual-career couples in academia and healthcare use a variety of coping mechanisms to manage the work-family interface, such as; effective communication, shared decision-making, boundary-setting, seeking social support, and utilizing available workplace policies and mechanisms.

REFERENCES

Adebayo, A. M., Adebayo, O. F., & Fashiku, B. O. (2019). Work-family conflict and job satisfaction among dual-career couples in Nigeria. Journal of Human Resources Management and Labor Studies, 7(3), 33-49.

Adegoke, A. R., & Aluko, O. M. (2019). Work-family conflict and coping strategies among female nurses in Lagos State, Nigeria. International Journal of Africa Nursing Sciences, 10, 1-5.

Ajayi, O. M., Ogunfowora, B., & Idemudia, E. S. (2018). Work-family interface and employee well-being: The moderating role of resilience among Nigerian dual-career couples. Journal of Family Issues, 39(17), 3948-3971.

Alabi, O. A., & Nwonu, E. U. (2019). The impact of work-family conflict on the job performance of female nurses in Nigeria. Journal of African Studies and Development, 11(5), 87-94.

Adelaiye, A. B., & Olugbenga, O. O. (2021). Work-family conflict and job satisfaction of healthcare professionals in Nigeria. Journal of Health Organization and Management, 35(3), 324-340.

Allen, T. D., Herst, D. R., Bruck, C. S., & Sutton, M. (2000). Consequences associated with work-to-family conflict: A review and agenda for future research. Journal of Occupational Health Psychology, 5(2), 278-308.

Amoo, E. O., & Oladejo, M. A. (2019). Work-family conflict and burnout among female teachers in selected secondary schools in Osun State, Nigeria. International Journal of Educational Management, 33(3), 446-458.

Carlson, D. S., Kacmar, K. M., & Williams, L. J. (2000). Construction and initial validation of a multidimensional measure of work-family conflict. Journal of Vocational Behavior, 56(2), 249-276.

Frone, M. R., Russell, M., & Cooper, M. L. (1992). Antecedents and outcomes of work-family conflict: Testing a model of the work-family interface. Journal of Applied Psychology, 77(1), 65-78.

Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. Academy of Management Review, 10(1), 76-88.

Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D., & Rosenthal, R. A. (1964). Organizational Stress: Studies in Role Conflict and Role Ambiguity. New York: Wiley.

Kossek, E. E., & Ozeki, C. (1998). Work-family conflict, policies, and the job-life satisfaction relationship: A review and directions for future research. Journal of Occupational Health Psychology, 3(2), 98-113.

Ogunfowora, B., & Idemudia, E. S. (2019). Work-family interface and career satisfaction among dual-career couples in Nigeria: The role of family-friendly policies. Journal of African Business, 20(3), 326-346

Olumide, A. O., Ige, J. O., & Adegun, O. B. (2018). Effective interactions: Communication and high levels of marital satisfaction. Journal of Psychology in Africa, 28(2), 161-167. DOI:10.1080/14330237.2018.1435041.

Nwachukwu, C. C., Ogbu, J. D., & Nwosu, C. O. (2020). Work-family conflict and psychological well-being of dual-career couples in Nigeria. International Journal of Research in Social Sciences, 10(2), 49-59.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

RANSOMWARE DETECTION SYSTEM USING RANDOM FOREST CLASSIFIER

Badia Bello & Nurudeen M. Ibrahim
Nile University of Nigeria, Nigeria
balabadiya2@gmail.com; nurudeen.ibrahim@nileuniversity.edu.ng

ABSTRACT
Ransomware attacks have emerged as a significant cyber security threat, targeting individuals, businesses, and critical infrastructure worldwide. To effectively combat this evolving menace, there is a critical need for advanced detection and mitigation strategies. In response, this paper proposes a ransomware detection system using the random forest classifier to accurately identify ransomware based on their characteristics, behavior, and underlying mechanisms. Through feature extraction and selection, the system extracts discriminative features from ransomware samples, enabling the detection model to distinguish between benign and malicious software. Experimental evaluation demonstrates the efficacy and robustness of the proposed classification system in accurately categorizing ransomware and detecting emerging threats.

Keywords; *Cyber security, Ransomware, Detection, Machine Learning, Random Forest*

1.0 INTRODUCTION

Ransomware has emerged as one of the most pervasive and damaging cyber threats in recent years, posing significant risks to individuals, businesses, and critical infrastructure. This malicious software encrypts valuable data and demands payment, typically in cryptocurrency, for its release, leading to financial losses, operational disruptions, and compromised data integrity [1]. The rapid increase of ransomware variants, coupled with sophisticated evasion tactics employed by cyber-criminals, has rendered traditional security measures inadequate in mitigating this threat [2]. The need for effective ransomware detection and classification systems has become paramount in the face of escalating attacks. Existing cybersecurity solutions often rely on signature-based detection methods, which struggle to keep pace with the evolving landscape of ransomware threat [3]. As a result, there is a growing demand for advanced detection systems capable of accurately identifying and categorizing ransomware based on their unique characteristics and behaviors [4]. The development of a ransomware detection system is motivated by several key factors:

- Diverse Ransomware Landscape: The ransomware ecosystem is characterized by a diverse array of variants, each employing different propagation methods, encryption techniques, and evasion tactics. A comprehensive classification system can help dissect this complexity and provide insights into the underlying mechanisms of ransomware attacks [5].
- Detection Challenges: Traditional detection methods often fail to detect new and polymorphic ransomware variants, which mutate rapidly to evade detection by antivirus software and other security measures [6]. A robust classification system can enhance detection capabilities by identifying behavioral patterns and signatures indicative of ransomware activity [7].
- Mitigation Strategies: Effective mitigation of ransomware threats requires a deep understanding of their characteristics and behaviors. By categorizing ransomware variants based on their attributes, organizations can tailor mitigation strategies to address specific threats and minimize the impact of attacks [8].
- Cybersecurity Resilience: Building resilience against ransomware attacks necessitates proactive measures, including the development of advanced detection and classification systems. By proactively identifying and classifying ransomware variants, organizations can bolster their cybersecurity posture and enhance their ability to respond to emerging threats effectively [9].

Considering these considerations, the proposed ransomware detection system seeks to contribute to the ongoing efforts to combat ransomware threats. By leveraging machine learning, dynamic analysis, and behavioral analysis techniques, the system aims to provide a scalable and robust solution for accurately categorizing ransomware variants and detecting emerging threats in real- time [10]. Through empirical evaluation and validation, this study aims to demonstrate the efficacy and practical utility of the proposed detection system in enhancing cybersecurity resilience and mitigating the impact of ransomware attacks on organizations and individuals alike [11].

2.0 RELATED WORK

Ransomware continues to be a significant cyber security threat, evolving in complexity and sophistication over time. Traditional anti-ransomware systems often struggle to keep up with these advanced threats, leading to the development of machine learning (ML) and neural network-based architectures for more effective detection and classification.

Masum et al. (2022) explored the application of traditional machine learning classifiers such as Decision Tree, Random Forest (RF), Naïve Bayes, Logistic Regression, and neural network architectures like LSTM and DNN for detecting ransomware. Their research highlights the potential of ML algorithms to enhance ransomware detection, but also notes the limitations in classifier performance, particularly in accurately classifying different types of ransomware. The study suggests that while ML classifiers can improve detection rates, their effectiveness is often limited by the sophistication of the ransomware being analyzed.

Similarly, Bhaldar et al. (2023) employed classifiers like Decision Tree, RF, and XGBoost in their study. Their findings indicated that the RF classifier outperformed others in terms of accuracy, precision, and F-measure, demonstrating the effectiveness of ML algorithms in identifying and categorizing ransomware. However, they also acknowledge that traditional anti-ransomware programs struggle with newer, more complex threats, highlighting the need for ongoing innovation in detection strategies.

Chamupathi et al. (2023) conducted a comprehensive review of ransom ware detection systems, comparing existing works and methodologies. Their analysis revealed that machine learning-based systems, particularly those utilizing CF-NCF for feature vector generation, are highly accurate in detecting ransomware attacks. They also explored the effectiveness of honeypots and network analysis approaches, concluding that these methods are more successful than traditional key backup methods in combating ransom ware.

(2024) examines ransomware detection methods, highlighting the widespread adoption of regression algorithms in ML-based detection systems. The study introduces a hybrid algorithm that combines regression and rule-based approaches, offering a more robust solution for ransomware detection. However, Tezcan also notes the challenges associated with ML algorithms, such as the need for careful algorithm selection to mitigate biases and avoid overfitting. The study underscores the importance of integrating both static and dynamic analysis modules to enhance detection accuracy, especially against encrypted or multi-phase ransomware attacks.

The evolution of ransomware tactics, as detailed by Nagar (2024), underscores the challenges faced by detection systems. Early ransomware relied on basic encryption and delivery methods, while modern variants employ advanced techniques like obfuscation, encryption, and sandbox evasion. Nagar's review discusses how modern ransomware, such as Cerber and Maze, has introduced new tactics like double extortion, making detection even more challenging. The study also emphasizes the importance of multi-factor authentication (MFA) and other mitigation strategies to enhance security and reduce the impact of ransom ware attacks.

The study by Jun et al. (2024) takes a different approach by focusing on real-time ransom ware detection through system call-based methods. By extracting system call logs and identifying behavioral patterns using regular expressions and finite state machines (FSMs), they developed a real-time detection system capable of high-level explainability. Despite its effectiveness, the study highlights limitations such as extensive analysis time in standard dynamic analysis approaches and the potential for overfitting due to a limited number of samples.

Despite the advancements in ML-based ransom ware detection, several challenges remain. Masum et al. (2022) and Tezcan (2024) both emphasize the limitations of ML classifiers, particularly in handling sophisticated ransom ware that employs advanced evasion techniques. Additionally, Tezcan points out the costly and time-consuming setups required for behavioral analysis, as well as the ineffectiveness of static analysis against encrypted ransom ware. Future research should focus on enhancing the robustness of ML algorithms by integrating hybrid approaches that combine static, dynamic, and real-time analysis methods. Furthermore, addressing the limitations of current detection systems, such as overfitting and bias in ML algorithms, will be crucial for developing more effective ransomware prevention strategies.

3.0 METHODOLOGY

This section details the approach taken to achieve the research objectives, focusing on data collection, model selection, preprocessing, model development, training, and evaluation. The primary aim is to develop a robust ML model to accurately distinguish between benign files and ransomware.The RF classifier was selected for its robustness, accuracy, and ability to handle high-dimensional data, making it suitable for ransomware detection. Unlike traditional signature-based techniques, the RF classifier offers flexibility and scalability, critical for dealing with complex datasets.

Data Collection

The dataset includes benign and ransomware files from the Kaggle ransomware dataset (cite the reference where the data was gotten from). Extracted features include metadata like FileName, md5Hash, Machine, and DebugSize.

Data Attributes:

md5Hash: MD5 hash of the file.
DebugSize, DebugRVA: Debugging information.
ExportRVA, ExportSize: Export directory details.
IatVRA: Import address table.
MajorLinkerVersion, MinorLinkerVersion: Linker version information.
NumberOfSections: Number of sections in the executable.
SizeOfStackReserve: Stack reserve size.
DllCharacteristics: Characteristics of the DLL.
ResourceSize: Size of resources.
BitcoinAddresses: Presence of Bitcoin addresses in the file.
label: Classification label indicating benign (0) or ransomware (1).

Preprocessing

i. Label Encoding: Convert labels to numerical format.
ii. Feature Selection: Select top 10 features using SelectKBest.
iii. Handling Imbalance: Apply SMOTE to balance the dataset.

Model Training and Evaluation

i. Data Splitting: 80% for training, 20% for testing.
ii. Scaling: Normalize features using StandardScaler.
iii. Model Training: Train the RF classifier on scaled features.
iv. Evaluation: Assess the model using precision, recall, F1-score, and confusion matrix.

Design of the Proposed System

System Requirements and Libraries

Development Components:

i. Languages/Frameworks: Python, Flask, HTML/CSS/JavaScript.
ii. Environment: Visual Studio Code for development and debugging.

Key Libraries:

i. pandas: Data manipulation and analysis.
ii. sklearn.model_selection: Data processing.
iii. joblib: Efficient serialization of models.

Data Preprocessing and Model Training

i. Loading the Dataset: Data is loaded into a pandas DataFrame.
ii. Data Cleaning and Preparation: Handle missing values and encode the target variable.
iii. Feature Selection: Use SelectKBest to identify top features.
iv. Data Splitting and Scaling: Split data into training/testing sets and scale features.
v. Model Training and Evaluation: Train the RF classifier and evaluate performance.
vi. Model Saving: Save the model, scaler, and selector for later use in the Flask application.

PERFORMANCE EVALUATION

Evaluating the performance of a ML model is essential to understand its effectiveness in a classification task. For the RF classification system developed in this study, several key metrics were used to quantify its performance. Below is a detailed discussion of the most commonly used evaluation metrics:

Accuracy: Accuracy measures the proportion of correctly classified instances out of the total number of instances. Accuracy provides an overall measure of the model's correctness. However, it may be misleading for imbalanced datasets, as it does not account for the distribution of classes. The formula for accuracy is shown below:

$$\text{Accuracy} = \frac{\text{Number of correct predictions}}{\text{Total number of predictions}}$$

Precision: Precision quantifies the proportion of true positive predictions out of all the positive predictions made by the model. Precision is crucial when the cost of false positives is high, indicating how accurate the positive predictions are. The formula for accuracy is shown below:

$$\text{Precision} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Positives}}$$

Recall (Sensitivity): Recall measures the proportion of true positive predictions out of all actual positive instances in the dataset. Recall is particularly important when the cost of false negatives is high, reflecting the model's ability to identify all positive instances.

$$\text{F1-Score} = \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

F1-Score: The F1-score is the harmonic mean of precision and recall, providing a balanced metric that considers both false positives and false negatives.

$$\text{F1-Score} = \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

4.0 RESULTS AND ANALYSIS

The evaluation results as shown in Table 1 and Figure 1 indicate that the RF model performs exceptionally well in classifying both normal and ransomware files. With 100% precision for normal files and 99% for ransomware, the model is highly accurate in its positive predictions, minimizing false alarms. The recall rates, at 99% for normal and 100% for ransomware, show that the model effectively identifies nearly all actual instances of each class. The consistent F1-Scores of 99% for both categories reflect a well-balanced model that excels in both precision and recall. Overall, the model demonstrates high reliability and effectiveness in distinguishing between benign and ransomware files.

Table 1: Classification Result

	Benign	Ransomware
Precision	100%	99%
Recall	99%	100%
F1-Score	99%	99%

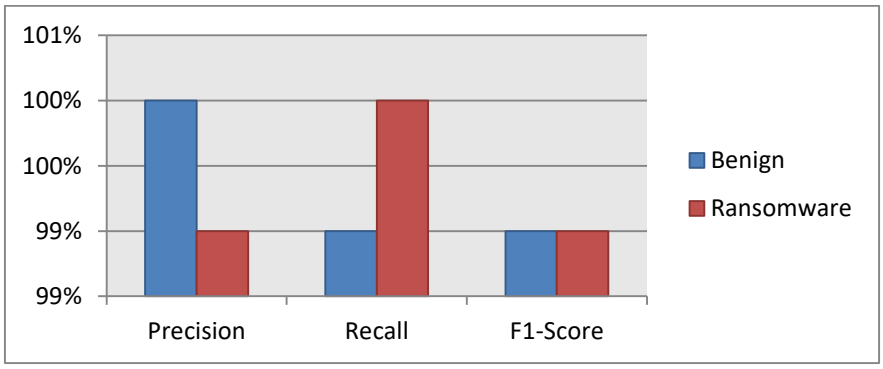


Figure 1: Classification Result

5.0 CONCLUSION

This work successfully developed a robust RF-based classifier to distinguish between benign files and ransomware with high accuracy. Through careful model selection, preprocessing, and evaluation, the classifier achieved exceptional precision, recall, and F1-scores, ensuring reliable detection. The system's effectiveness in handling high-dimensional data and providing interpretable results highlights its potential for real-world applications in cyber security. The results demonstrate the model's capability to minimize both false positives and false negatives, making it a valuable tool for ransomware detection. Future work could explore additional features and models to further enhance detection capabilities.

REFERENCES

Symantec. (2020). *The Evolution of Ransomware: How to Prepare for the Next Wave*.

Europol. (2021). *Internet Organized Crime Threat Assessment (IOCTA) 2021*. Retrieved from Europol.
McAfee Labs. (2019). *Threats Report: November 2019*.
Kaspersky. (2018). *The Future of Ransomware*.
Trend Micro. (2021). *Ransomware Variants and Trends*.
IBM Security. (2020). *2020 X-Force Threat Intelligence Index*.
Fortinet. (2019). *Understanding Ransomware and Its Behavioral Patterns*.
Palo Alto Networks. (2021). *Ransomware and Its Impact on Security Strategies*.
Cisco Talos. (2020). *Ransomware Resilience and Response*.
Verizon. (2020). *Data Breach Investigations Report*.
FireEye. (2019). *Ransomware Protection and Containment Strategies*.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

FILE INTEGRITY MONITORING SYSTEM

Emmanuel Adeleke & Nurudeen M. Ibrahim
Nile University of Nigeria, Nigeria
adelemmanuel113@gmail.com nurudeen.ibrahim@nileuniversity.edu.ng

ABSTRACT
This study focuses on developing a user-friendly File Integrity Monitoring (FIM) system that addresses existing gaps in accessibility and technical complexity. By utilizing cryptographic hashing, the system establishes a baseline for files and continuously monitors for unauthorized changes, providing timely alerts to security personnel. In Nigeria, where FIM technology adoption is limited, this solution aims to bridge the gap by offering an interface that does not require extensive technical expertise. Key features include real-time monitoring, comprehensive reporting, and integration with existing security protocols to enhance data protection. The system is designed to reduce the time between detection and resolution of integrity incidents, thereby mitigating potential security breaches and ensuring compliance with regulatory standards. Ultimately, this project aims to improve organizational security by safeguarding critical data and promoting the adoption of advanced cyber security measures in regions with limited technological infrastructure.

Keywords *File Integrity Monitoring, Checksum, Integrity, Hashing Algorithms*

1.0 INTRODUCTION

File integrity is a critical aspect of cybersecurity, forming one of the core components of the CIA triad, which encompasses Confidentiality, Integrity, and Availability. It refers to the processes and implementations aimed at protecting data from unauthorized changes, such as those resulting from cyber-attacks. Ensuring the integrity of a file involves confirming whether it has been altered by unauthorized users after its creation, during storage, or upon retrieval. File Integrity Monitoring (FIM) is a control mechanism that examines files to verify their integrity, alerting relevant security processes and professionals if any unauthorized changes are detected. This type of software considers every change suspicious unless defined as an exception, making FIM an essential tool in increasingly complex network and configuration environments (Logsign, 2019).

FIM is particularly crucial as it scans, analyzes, and reports unexpected changes to critical files within an IT environment, providing a critical layer of security for files, data, and applications. Additionally, it accelerates incident response. The primary use cases for FIM include detecting illicit activity, pinpointing unintended changes, verifying update status, monitoring system health, and meeting compliance mandates (BeyondTrust, 2014). Early FIM systems were built on the principle of cryptographically hashing a file to establish a baseline, then detecting deviations from this baseline. However, these systems were often criticized for being "not scalable," "noisy," generating "false positives," and being "unmanageable." Despite these limitations, the industry's perspective on FIM has remained largely unchanged.

The foundational concept of FIM, identifying deviations from a baseline, merely indicates that a change has occurred but does not differentiate between malicious or benign, expected or unexpected, or approved or evaded changes. Early FIM technologies struggled to make these distinctions, only signaling that a file had been altered. Moreover, the first companies developing FIM technology faced unexpected executive management changes that caused them to lose sight of the broader goal of integrating integrity within a comprehensive security strategy, leading to stagnation in innovation and understanding.

To address these challenges, a fundamental shift in perspective was required. Instead of focusing solely on identifying unexpected or negative changes, the approach shifted toward managing changes from a known good state. Once all positive and anticipated changes are recognized, any deviation, whether malicious or a process anomaly, becomes apparent. In this new paradigm, deny listing or file reputation services are no longer the sole factors in determining whether a file or update is good or bad, but rather one of many data points that inform the overall assessment of file integrity. This shift in perspective aims to enhance the effectiveness and scalability of FIM systems, ensuring that they remain a vital component of modern cyber security strategies. Existing FIM systems often suffer from a lack of user-friendly interfaces and are burdened

with cumbersome instructions and on-site data requirements, necessitating prior technical knowledge for effective operation. Moreover, in Nigeria, there is a significant gap in the availability and adoption of FIM technology. It is not widely prevalent, and most organizations lack an effective FIM system. The proposed system aims to address these challenges by offering a more accessible, user-friendly solution that does not require extensive technical expertise, thereby enhancing the adoption and effectiveness of FIM technology in Nigeria.

2.0 RELATED WORK

Literature on FIM reveals significant advancements and diverse approaches to enhancing the security of sensitive files in computer systems.

Shi et al. (2018) proposed a novel system named Vanguard, addressing the limitations of traditional FIM tools that struggle with monitoring files in memory due to semantic gap problems. Vanguard is designed to monitor both I/O operations and cache operations, providing cache-level protection and effectively detecting illegal file modifications that might otherwise bypass detection by hiding in the cache. Implemented on the QEMU/KVM platform and supporting Linux and Windows, Vanguard is isolated from the monitored system, enhancing its resilience against subversion. Experimental results demonstrated Vanguard's effectiveness and acceptable performance overhead, marking it as a significant improvement in runtime file integrity monitoring.

Song et al. (2020) introduced IFSCQ, a certified cryptographic file system that integrates cryptographic primitives with formal verification to protect against tampering. Unlike traditional file systems that may be vulnerable to adversaries with limited disk access, IFSCQ employs a Merkle hash tree to secure the entire disk, ensuring that any tampered disk blocks are detected. This system is particularly effective against "untrusted storage" threats, such as silent bit errors or rollback attacks. IFSCQ extends existing work on cryptographic and certified file systems, achieving strong integrity guarantees with reasonable overhead.

WebSGuard, is a real-time FIM system designed for Windows-based environments, specifically targeting unauthorized changes in files or directory structures. WebSGuard operates as a client-server system, where client agents are installed on monitored web servers, reporting real-time changes to a server application that manages clients and alerts administrators. Currently deployed in the University Goce Delcev intranet, WebSGuard demonstrates practical applicability in monitoring web applications, highlighting its utility in real-world scenarios.

Abdullah (2011) addressed the limitations of existing FIM tools by proposing a hybrid approach that combines offline and online file integrity monitoring with a dynamic inspection scheduling algorithm. By classifying files based on their security level and adjusting the monitoring schedule accordingly, this approach enhances the detection of malicious modifications in critical system files. Initial testing showed that this method effectively improves online detection, offering a more nuanced and responsive monitoring strategy.

These works collectively contribute to the evolving landscape of file integrity monitoring, each addressing specific challenges and proposing innovative solutions to enhance file security in various computing environments.

3.0 METHODOLOGY

Proper selection of the software development approach that best fits the project in order to manage it successfully. This section covers the application requirements, the selected technique, and diagrams.

PROPOSED METHODOLOGY

The proposed model for the system is the Agile Methodology**.** Agile methodology is a project management approach that prioritizes adaptability, teamwork, and client satisfaction, especially in software development. The agile model has 6 phases; requirement gathering, design, development, test, deployment and review. The flowchart of the proposed system is shown in Figure 1.

PLANNING PHASE

This crucial stage in the agile development process focuses on collecting and documenting stakeholder requirements and expectations to define the project's scope. The Agile approach highlights iterative and collaborative requirement gathering, enabling flexibility and adaptability to changes.

REQUIREMENT ENGINEERING

Requirement engineering for this project involves collecting various user requirements. These requirements are divided into two categories: user requirements and system requirements. The system requirements are further categorized into functional and non-functional requirements.

REQUIREMENT SPECIFICATION

A system's requirements are only the qualities that the suggested system ought to possess; these criteria are divided into functional and non-functional categories as shown in Tables 1 and 2.

Table 1: Functional Requirements Specification

Requirement ID	Description of requirement
R-01	The FIM tool should monitor changes to files and directories at specified intervals. It should be able to track modifications, additions, deletions, and movements of files.
R-02	Ensure the integrity of monitored files by comparing cryptographic hashes or checksums before and after changes.
R-03	Monitor changes to user accounts, permissions, and access control lists (ACLs) for files and directories.
R-04	Allow administrators to establish a baseline of authorized file states to identify variations from the expected configuration.
R-05	Maintain an audit trail of file changes for compliance purposes. Generate comprehensive reports on file integrity and security events.
R-6	Support compliance requirements by facilitating adherence to regulations such as PCI DSS, HIPAA, or other relevant standards
R-7	Offer a centralized management console for configuration, monitoring, and reporting.

Table 2: Non-Functional Requirements

Requirement ID	Description of requirement
R-11	The FIM tool should provide monitoring with low latency for detecting file changes.
R-12	The FIM tool should scale horizontally to accommodate the growing number of files and changes in large enterprise environments.
R-13	Implement secure communication protocols to protect sensitive information transmitted between components.
R-14	Provide a user-friendly interface for configuring settings, monitoring, and generating reports.
R-15	Ensure the FIM tool maintains detailed and tamper-evident logs to support auditing and forensic analysis.
R-16	The FIM tool should facilitate compliance with relevant regulations and standards, providing features and documentation necessary for audits.

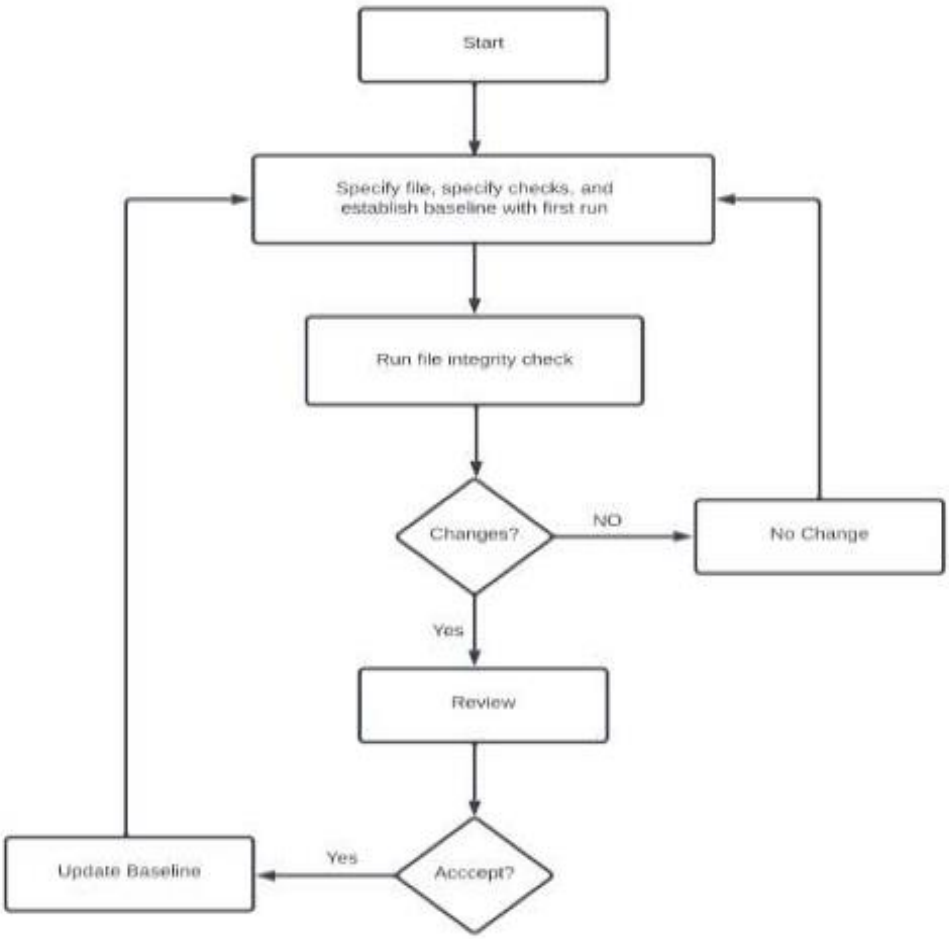


Figure 3.2: Flow Chart of the Proposed System

4.0 IMPLEMENTATION

This section explores the stages of implementation and discussion for the FIM. It discusses the technology and methods used in development and testing as it examines the practical side of implementing the suggested system.

4.1 Tools/Languages Used

The file integrity system was developed using a combination of PHP, MySQL, Bootstrap Framework, and jQuery. PHP served as the backbone for the backend logic, handling file operations, user authentication, and data processing. MySQL was utilized as the relational database management system for efficient data storage and retrieval. On the front-end, we leveraged the Bootstrap Framework to streamline the design and ensure responsiveness across various devices. Additionally, jQuery was employed to enhance user interactions and facilitate dynamic content manipulation, contributing to a seamless user experience.

4.2 Implementation Issues

During the implementation phase, we encountered several challenges. One significant issue was ensuring the security and integrity of user-uploaded files and directories. We also faced complexities in implementing file change detection mechanisms, particularly in shared directories where multiple users could modify files simultaneously. Additionally, optimizing the system for scalability and performance posed another hurdle.

4.3 Solution to Implementation Issues

To address security concerns, we employed robust authentication and authorization mechanisms, ensuring

that only authenticated users have access to their designated directories and files. We implemented encryption techniques to safeguard sensitive data, such as user credentials and file contents, during transmission and storage. For detecting file changes, we implemented checksum algorithms to compute unique identifiers for each file. By periodically comparing checksums against stored values, we could promptly identify any alterations to file contents. To optimize performance and scalability, we employed caching mechanisms and database indexing, minimizing query times and enhancing system responsiveness.

5.0 CONCLUSION

This section serves as a summary and conclusion of the in-depth investigation and development of a file integrity monitor. By ensuring the integrity of data and documents in transit, the project aims to strengthen cyber security safeguards through a cycle of hashing and comparison. This section looks at the entire process, from design to testing, discussing the system's functionality, degree of goal compliance, and impact on the target user base. In addition to offering a critical overview of the project's outcomes, it evaluates the challenges encountered during the development phase and the solutions implemented.

REFERENCES

Albeniz, A. H. P. de. (2021). *File Integrity Monitoring on Linux Systems* (Bachelor's/Master's thesis). Department of Computer Engineering/Computer Science, Universidad del País Vasco, Basque Country.

Alhussen, A., & Arslan, E. (2021). Avoiding data loss and corruption for file transfers with fast integrity verification. *Journal of Parallel and Distributed Computing*, *152*, 33-44. https://doi.org/10.1016/j.jpdc.2021.02.002

Allers, M. (2023). The comprehensive guide to file integrity monitoring. *Cimcor*. Retrieved from https://www.cimcor.com/blog/the-comprehensive-guide-to-file-integrity-monitoring

Bañas, J. C., & Mababa, J. C. (2023). File integrity verifier using a digital signature algorithm and SHA-256 with memory-mapping technique. *International Journal of Computing Sciences Research*, *7*, 2348-2357. https://doi.org/10.25147/ijcsr.2017.001.1.164

Chen, L., et al. (2020). A practical low-cost security solution for log management and file integrity monitoring. *Department of Information Technology, Georgia Southern University, Statesboro, Georgia, USA; Department of Information Technology, Kennesaw State University, Kennesaw, Georgia, USA; Google, Mountain View, California, USA.*

Merriam-Webster. (n.d.). Definition of CHECKSUM. In *Merriam-Webster.com*. Retrieved March 10, 2022, from https://www.merriam-webster.com

nCircle. (2014). File integrity monitoring - Agentless solutions. *Archive.org*. Retrieved from https://web.archive.org/web/20120410044335/http://www.ncircle.com/index.php?s=products_ccm_file-integrity-monitoring

Logsign. (2019). What is file integrity? Retrieved January 22, 2024, from https://www.logsign.com/blog/what-is-file-integrity/

Mane, P. P., et al. (2023). File integrity monitoring. *International Research Journal of Modernization in Engineering, Technology and Science*, *5*(4), 5574. Retrieved from www.irjmets.com

Sankar, N. A., & Fasila, K. A. (2023). Implementation of SOC using ELK with integration of Wazuh and dedicated file integrity monitoring. In *2023 9th International Conference on Smart Computing and Communications (ICSCC)* (pp. 350-354). Kochi, Kerala, India. https://doi.org/10.1109/ICSCC59169.2023.10334992

Song, D. W. (2020). The design and implementation of a verified file system with end-to-end data integrity (Publication No. 28735556) [Doctoral dissertation, Rice University]. *ProQuest Dissertations Publishing*.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

RATINGS OF DEVIANT BEHAVIOUR AMONG IN-SCHOOL ADOLESCENTS IN NIGERIA: IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT

Ileola Elizabeth OLADIPO
Department of Peace and Conflict Studies, Afe Babalola University, Ado-Ekiti
ileolaeo@abuad.edu.ng

ABSTRACT
Research shows that deviant behaviour in schools continues to be a matter of great concern globally; with a more worrying trend in developing countries. Academic deviance includes status offenses for young people such as absenteeism, breaches of educational standards (such as disrupting class), academic misconduct (such as cheating) and criminal activities. This poses a threat to sustainable development in the society. High exhibition of deviant behaviours ultimately threatens the purpose of education which is to impart knowledge, skills, and values to individuals, enabling them to lead productive and fulfilling lives as well as having mental, physical, social abilities and competences to contribute positively to the society and the world. Hence, this study examined the ratings of deviant behaviours in school settings in Nigeria. The research engaged students and staff from two secondary school in Oyo State Nigeria. The findings show that there was a common consensus of high incidences of physical, verbal, and academic related deviant behaviours. The ratings on deviant behaviours are indications that the prevalence is higher among adolescents who are at the secondary school level of their education. The paper recommends counselling and remediation programmes/sessions for perpetrators of deviant behaviours in aspects of counselling psychology, career counselling and clinical counselling. The paper also recommends that government improve teachers' productivity through sponsorship of professional development and encourage stakeholders to cater for the needs and comfort of the students. The optimum utilization of these measures has the potential to address issues challenging the educational sector in Nigeria and across the world.

Keywords: *Academic Activities, Counselling, Curbing, Deviance, Secondary Education*

1.0 INTRODUCTION

Public discussions in Nigeria frequently focus on lack of educational standards as the cause of prominent underperformance of students in secondary schools. To a lot of people, it is questionable whether or not teachers in the public secondary schools, the most important factor in the effectiveness of schools and in the quality of a child's education are competent to teach effectively (Ayuba, 2018). Without faulting this area of concern, experts claim that stakeholders need to also focus on the role that deviance plays in academic performance of a student. According to Deepika (2020), certain factors such as deviance can cause a regression in academic success, which can negatively affect students' role performance. The study by Akanni (2021) also analysed some of the factors that hinder the performance of secondary school students on the National Examination Council- Senior School Certificate Examination in Nigeria showing that the learners' attitudinal factor has both positive and negative significant influence underpinning academic performances.

Deviance as an antisocial behaviour is also often traced to factors beyond the school such as parental influence, peer pressure and environment. Rachel et al (2022) for instance opined that deviant behaviour in secondary schools is caused by an interaction of different factors that can be traced within and outside school as two distinct yet overlapping environments where the student is socialized into deviance. Family factors that contribute to deviance include a history of drug and alcohol abuse, poor parent-child relationship, violence and socio-economic status of the family (Gidado and Diffang, 2023). The school factor such as inappropriate classroom management, teachers' humiliating remarks and teacher-pupil relations that are too strict have also been cited as a contributory factors (Mahome, 2024; Barongo et al., 2024), while peer pressure and youthful exuberance are also noted to have great impact on a student's likelihood of exhibiting deviant behaviour (Oladipo et al., 2024).
Although deviance as a phenomenon varies from one country to another, deviant acts in a school environment include truancy, drug and alcohol abuse, promiscuity, dodging class, riots, smoking, vandalism, fighting, reporting late for class, insulting staff, resistance to

change, among others (Effiom et al., 2023). These acts negatively influence the learning and teaching process as they undermine the purpose of education which is to impart knowledge, skills, and values to individuals, as well as mental, physical, social abilities and competences to contribute positively to the society and the world (Mbato & Nkeiru, 2024). This is crucial because, according to Okolie et al., (2022), when armed with accurate information and critical thinking abilities, youths can have full and effective participation in the processes of social, economic and political development. It becomes pertinent therefore, to evaluate deviant behaviours in school settings. This study addresses this by examining the ratings of the different types of deviant behaviours in selected secondary schools in Oyo State Nigeria. It aimed to shed light on how Nigeria can address issues challenging the educational sector through understanding the causes, prevalence and remedies for any vital prevention programme.

CONCEPTUAL DISCOURSE

Deviance

The word "deviant" is from the Latin word, *deviare* which is used to suggest a turning aside from the path or way (Pannaloka, 2022). A deviant is someone straying, wandering, or going astray from established norms (Lucchini et al 2020). To be a deviant is therefore, to be off the course in relation to a definite accepted norm or course of action. It is to do what is contrary to what most people would consider acceptable or normal. Such a person is considered to queer, weird, or divergent. S/he is sometimes referred to as someone who is twisted, unorthodox, pervert, heretical or kinky (Graves, 2024). In the field of Sociology, the notion of social deviance takes from this idea as the term deviance is used to refer to ways of acting which do not conform to the norms and expectation of a particular social group. It is that act, which is highly disapproved of such that a particular community finds it impossible to tolerate (Anleu, 2023). On the part of young folks, the idea of youthful delinquency or juvenile delinquency suggests the same thing as what is captured in the idea of deviance. Another term for deviant behaviour is "aberrant behaviour;" and it often results in generating problems like: peer-pressure, bullying, violence, maladaptation, crime and conflict with societal values (Hanmoglu, 2018). Deviant behaviours and attitudes may include truancy, vandalism, smoking, drug and substances abuse, alcoholism, harassment, skipping schools, disorderly conduct, sexual offenses, thuggery, theft, addiction to games and social media at the expense of studying, bullying, vandalism, cultism, examination malpractice and many other vices.

Though the society is the one that says what a deviant behaviour or attitude is, sometimes certain individuals occupying key positions may be more influential in deciding what is deviant behaviour or attitude. This is so because some individuals in the community have more power than others to define deviance. For instance, people who occupy high positions within economic, religious and political sectors are in a better position to determine what laws are enacted and to enforce their own definition of deviance (Banda and Mweemba, 2016).

It is important to point out that before an individual is called a deviant such a person must have consistently exhibited acts that are incompatible with the norms of a society over a period of time. Deviant behaviours are characterised by persistence and repetition (Hanimoglu, 2018). This caveat is needed in order to distinguish between a "deviant act" and "deviant behaviour." A deviant act is a onetime act being performed by an individual, while a deviant behaviour involves acts that have been performed repeatedly (Del Toro & Wang, 2022). It is also important to maintain this distinction because labelling an individual as a deviant because of just one action may in fact make the individual become deviant. What labelling does is that it makes some of those being labelled to internalise the belief that they are one and search out others who are deviants and this ensures that they are further pushed into the precipice (Banda and Mweemba, 2016). Constant negative labelling of students by teachers may lead to low self-esteem on the part of the student and this can affect the performance of the student in the particular course taught by the teacher (Ngwokabuenui, 2015).

Secondary Education

Generally speaking, the concept of secondary school derives its name from the fact that a set of years of formal education should be experienced by a child as a crucial stepping stone to higher education (Musengimana et al., 2021). Thus, secondary school is the second set of years that a child obtaining formal education is expected to spend while receiving structured education in certain subjects. In Nigeria, the standard of education stipulates a 6-3-3-4 educational system. A child is expected to spend six years in primary school and proceed to secondary school. The secondary education is divided into two stages, the first three years being the Junior Secondary School (JSS), while the second three years is the Senior Secondary School.

This makes secondary school education to be obtainable in six years. However, in order to meet the requirement of the law backing Universal Basic Education (UBE), children are expected to have at least nine years of education, which comprises of six years education at the primary school level and the first three years of

secondary school education (ref). This classification is in line with International Standard Classification of Education scale which sets the lower secondary school as the stage of completion of basic education (UNICEF, 2021).

Thus, the secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development (ref). After these, students who are successful with meeting the requirements of secondary education may then proceed to the tertiary education level, which could be a university, a polytechnic or monotechnic, or even a college of education. This makes the secondary school, the intermediate school between primary education and tertiary education.

2.0 EMPIRICAL REVIEW

Secondary School and Deviant Behaviour

Secondary school students are mostly adolescents who are often categorised as people between the age range of 10 to 19 years (Silva et al 2020). Thus, they are at a stage of their lives where they fall in-between childhood and adulthood. Adolescence is a time in which individuals experience physical and cognitive changes and start some independent decisions making (Bhatia et al 2023). Their ability, and newness, to independent decision-making could be an ingredient that spurs them to engage in deviant decision if they are not properly guided. This is why adolescence has been described by Zimmermann et al (2022) as a time of storm which indicates that it is a confusing as well as stimulating period in the life of children growing up and a stage that could generate a lot of stress to those around them.

This stage is characterised by mood disruptions, conflict with parents and risk taking behaviours (Bista et al., 2016). At this stage, adolescents have a greater tendency for recklessness, norm-breaking, as well as antisocial manners than either children or adults. Adolescents have a way of taking more risks than children, who are more closely watched and are cautious about their environments, they are also more willing to undertake more risks than adult because they are still learning to experiment with the world. Many adults have learnt from their mistakes and those of others and are thus more cautious.

The early secondary school years have been identified as a time when most students decide to continue or withdraw from schooling (McCarty et al., 2023). A contributing factor to this is that many students allow the adolescence and the tendency for deviance in them to go unbridled, and consequently begin to display challenging behaviours. Adolescents who engage in these behaviors are at higher risk of various adverse outcomes in adulthood, including unemployment, early parenthood, domestic violence, criminal activities, psychiatric disorders, substance abuse, increased injuries, health problems, higher rates of separation or divorce, and a shortened life expectancy.

The causes of deviant behaviour in secondary schools often extend beyond a student's attitude, disposition or genetics. These behaviours are not limited to activities within the school but are also influenced by family background, socio-economic status, exposure to other cultures (for example through movies and music), community role models, peer influence and more recently, social media. In addition, teachers' attitudes toward students and issues relating to these teachers' competence can also contribute to such behaviours. Some causes of deviant behaviour in schools have been identified as; lack of proper interaction between teachers and students, inefficient school administration, unqualified teachers, large and overcrowded schools, inadequate instructional materials, disjointed family structure, parent inadequacies, frequent school changes for students and bullying in the classroom or school (American Observer 2007 as cited by Dalhatu and Yunusa, 2013).

Deviant behaviour can start manifesting before students gain admission to secondary schools. This may be due to factors such as; lack of parental monitoring, delay in admission into secondary school due to financial constraints, death or divorce of parents, or relocation. Additionally, associating with the wrong set of people in the community as well as influence of the social media and pop culture may also contribute to the development of deviant behaviour. Students in secondary schools display patterns of rule-violating behaviour in an attempt to re-affirm their freedom from parents and other adults at the adolescence stage. If such behaviours continue to go unchecked, they may become too critical to handle. For example, when students sneak out of school to attend some social events in town and return late, they can receive a dozen strokes of cane. Over time, they may see this as a minor consequence and form the habit of skipping classes. This behaviour can result in serious truancy, negative self-concept and eventually criminal activity.

Deviant Behaviour and Attitude's Influence on Academic Activities and Performance

Students' deviant behaviours have been identified to include: boycotting lessons, watching and practicing pornography, violence, disobedience to teachers and prefects, alcohol consumption, confronting or stabbing teachers, vandalism, lateness, cultism, drug abuse, insulting, assaulting, stealing, rioting, examination malpractice, mass protests, inappropriate dressing to school, and others forms of misconduct (Ngwokabuenui,

2015). In a study of 50 respondents composed of students, teachers and school management from eight schools in Bungoma County, Kenya, it was discovered that deviant acts among students that constitute deviant behaviours include: theft, bullying, drug abuse, alcohol abuse, vandalisation of property, sexual promiscuity, boycotting of class, cheating in examinations, pornography, riot, smoking, fighting, lateness, truancy, sneaking out of school, graffiti on school walls, rudeness, and violence (Nabiswa et al., 2016). These acts negatively influence the learning and teaching process, undermining the purpose of education. For these scholars, knowledge of the various deviant behaviours will aid the development of good prevention programmes. An analysis of the schools in Bungoma County, Kenya, revealed that the prevalence of these deviant behaviours and attitudes rangessd from 3% to 21%.

In another study that was aimed at examining causes and effects of deviant behaviours among Turkish high-school students and identifying possible strategies for combating deviant behaviours, observed that deviant behaviour led to problems of conformity with societal values. Deviant behaviour was noted to increase every year and led to problems that included: peer-pressure, bullying, violence in schools, social maladaptation and crime. Acts found to constitute deviant behaviours in this study include: alcohol consumption, smoking, consumption of other illicit drugs, suicide attempts, bullying, addiction to computer games and addiction to social media (Hanimoglu, 2018). In yet another study conducted in Asari-Toru Local Government in Rivers State, Nigeria, it was revealed that the use of foul language, truancy, smoking and substance abuse, stealing, pilfering, bullying, and threatening teachers were the rampant deviant behaviours. On the basis of this, it is asserted that deviant behaviour is the reason for a number of problems encountered in the teaching and learning process in many secondary schools in Nigeria and more importantly, the authors reported that, deviant behaviour reduced the quality of education received by students (Ugwu and Diamond, 2017). Deviant behaviours are also identified as destructive practices which cause major and continuous administrative problems among secondary schools. Deviant behaviours also account for students dropping out of secondary schools and consequently failing in attaining their potentials. Students who exhibit deviant behaviours also become uncontrollable, and highly disrespectful to teachers, school administrators, parents, and society at large (Ngwokabuenui, 2015). Deviant behaviours may also ensure that even when student graduate from secondary schools they are half-baked as they often fail to have sufficiently acquire the set of appropriates skills, knowledge, values, attitudes and competencies. This happens for instance when students are suspended for a period of time as punishment for certain display of deviant behaviour. Such a student will, no doubt, miss out on essential lessons during the period he/she is away from the school.

Likewise, Chikwatureet al (2016) posited that, deviant behaviour has detrimental effects on academic performance. It disrupts the learning environment, particularly during incidents like riots, causing stress for both students and teachers. This disruption can lead to low pass rates or outright failure among students. Also, those who exhibit deviant behaviour often struggle with poor concentration which hinders their performance. Non-deviant students, also suffer the consequence of deviance displayed by some students as they may be left unattended while teachers address issues of deviance by the other students and in extree situations like riot, the educational facility may be closed affecting everyone guilty whether guilty or not and repair costs are also jointly shared.

Theoretical Framework

Differential Association Theory

Differential association theory was developed by Edwin H. Sutherland. He developed this theory in his book, *Principles of Criminology* written in 1939 (Vinney, 2019). Succinctly put, this theory holds that deviance is a "learned behaviour" gathered from the associations one forms in one's environment. The environment, according to this theory, plays a major role in deciding the norms people violate; and the various socialisation agents like parents, teachers, family and friends, among others, influence the deviant behaviour or attitude that an individual exhibits. The core of this theory centres around the belief that it is through the interaction one has with others that individuals learn the values, beliefs, attitudes, techniques, and motives for criminal behaviour.

The position of the differential association theory suggests that deviant attitude and behaviour are learned. In this regard, the theory shares something in common with the social learning theory. This theory holds that "learning is a cognitive process that takes place in a social context and can occur purely through observation or direct instruction" (Ayinde and Olasehinde-Williams, 2020). By sharing this view, the differential-association theory holds that individuals learn through association with the deviant behaviour or attitude that they display. What this position also counters is the belief that people are innately bad or good. The individual is not born with a predisposition for evil, or good, rather it is the process of social interaction through communication that makes an individual good or bad and thus to be deviant or not.

3.0 METHODOLOGY

Descriptive survey design was adopted for the study. Purposive sampling technique was used to select two (2) public schools from two (2) Local government areas (LGAs) respectively: Methodist Grammar School, Bodija (Ibadan North LGA) and Orogun Grammar School, Orogun (Akinyele LGA). The Krjcie and Morgan (1970) table for determining sample size was applied to the actual population figures of students in both selected schools for the study and 369 students were selected from both schools. Four hundred questionnaires were administered however, only 395 were returned**.** A total of 50 staff members of both schools were used for the study. The Statistical Package for the Social Sciences (SPSS) was also used to establish the reliability and consistency of the test items as well as to analyse data.

4.0 RESULTS

Analysis of gender according to participating schools is presented in Figure 1.1. There were more males than males in Methodist Grammar school while females were more in Orogun Grammar School.

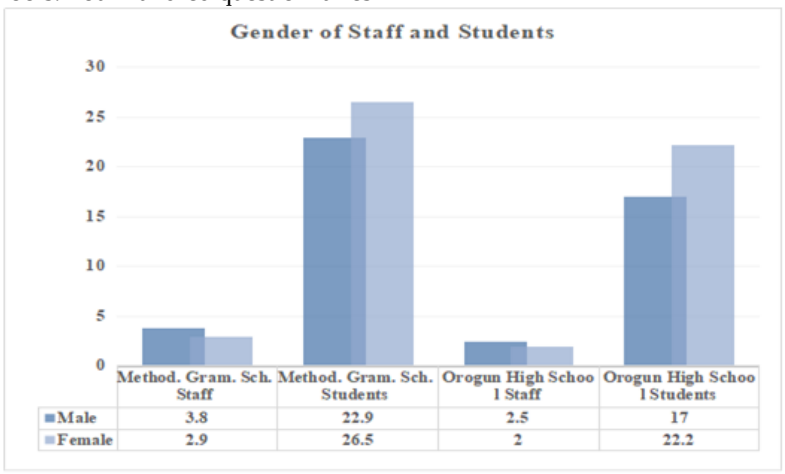


Figure 1.1: Gender of staff and students according to participating schools

Fig 1.2 **Teaching and Non-Teaching Staff of Methodist Grammar School and Orogun Grammar School**

Staff of schools that participated in the study comprised of the teaching and non-teaching staff. As presented in Figure 1.2 for teaching staff, Methodist Grammar School and Orogun Grammar School had a total of 26 (52%) and 17 (34%) respondents respectively; while for non-teaching staff, both schools had 4 (8%) and 3 (6%) respondents respectively.

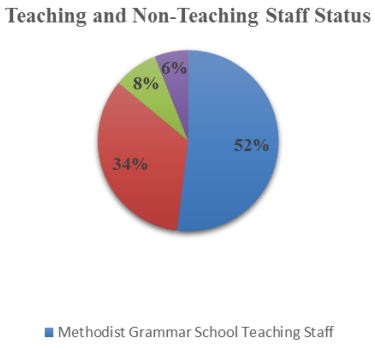


Table1.1 presents the ratings of both staff and students in relation to deviant behaviours. Deviant behaviours under investigation were categorised under three subsections, namely drug related deviant behaviour; physical and verbal related deviant behaviour; and school and

academic related deviant behaviour. Use of drugs under drug related deviant behaviour was rated by majority of the respondents as very low, while 90 of the respondents rated same activity as very high. Among the respondents, 24 and 41 had ratings of low and high respectively for drug use as a deviant behaviour among school adolescents.

Table 1.1: Frequency and Percentage Ratings for Identified Deviant Behaviours Exhibited Among Staff and Secondary School Students

S/N	Deviant behaviours according to categories	No Response	Very Low	Low	Undecided	High	Very High
	Drugs related deviant behaviours						
1.	Use of Hard Drugs	25 (5.6%)	184 (41.3%)	24 (5.4%)	81 (18.2%)	41 (9.2%)	90 (20.2%)
	Physical and Verbal Related Deviant Behaviours						
2.	Bullying	31 (7.0%)	158 (35.5%)	54 (12.1%)	64 (14.4%)	43 (9.7%)	95 (21.3%)
3.	Violence/Fighting	24 (5.4%)	153 (34.4%)	54 (12.1%)	58 (13.0%)	65 (14.6%)	91 (20.4%)
4.	Stealing	25 (5.6%)	167 (37.5%)	44 (9.9%)	45 (10.1%)	65 (14.6%)	99 (22.2%)
5.	Using abusive language	33 (7.4%)	136 (30.6%)	52 (11.7%)	74 (16.6%)	42 (9.4%)	*108 (24.3%)
	School and Academic-Related Deviant Behaviours						
6.	Not attending classes	26 (5.8%)	144 (32.4%)	50 (11.2%)	63 (14.2%)	45 (10.1%)	*117 (26.3%)
7.	Examination Malpractice	26 (5.8%)	137 (30.8%)	79 (17.8%)	66 (14.8%)	45 (10.1%)	92 (20.7%)
8.	Sneaking out of School	23 (5.2%)	159 (35.7%)	62 (13.9%)	87 (19.6%)	35 (7.9%)	79 (17.8%)
9.	Defacing/spoiling School Property	28 (6.3%)	150 (33.7%)	52 (11.7%)	63 (14.2%)	50 (11.2%)	*102 (22.9%)
10.	Disobedience to school authority	24 (5.4%)	159 (35.7%)	47 (10.6%)	86 (19.3%)	44 (9.9%)	85 (19.1%)
11.	Skipping School	25 (5.6%)	188 (42.2%)	50 (11.2%)	60 (13.5%)	33 (7.4%)	89 (20.0%)

For the four (4) listed deviant behavioural activities under physical and verbal related deviant behaviours, activities of bullying, violence/fighting, stealing and use of abusive language were rated as very low. Response rates for very low were 158 (35.5%), 153 (34.4%), 167 (37.5%) and 136 (30.6%) respectively. Response rates for very high were significantly lower than response rates of very low with respondents ratings for the physical and verbal related deviant behavioural activities being 95 (21.3%), 91 (20.4%), 99 (22.2%) and 108 (24.3%) respectively.

In relation to school and academic related deviant behavioural, Table 1 shows six (6) listed activities ranging from absenteeism in class to skipping school. Results show that 144 (32.4%), 137 (30.8%), 159 (35.7%), 150 (33.7%), 159 (35.7%) and 188 (42.2%) respondents rated the six (6) activities respectively as very low. Rating the same activities respectively, 117 (26.3%), 92 (20.7%), 79 (17.8%), 102 (22.9%), 85 (19.1%) and 89 (20.0%) respondents had ratings of very high. The obtained results on the listed deviant behaviour activities is an indication that in spite of the very low ratings recorded, it is a confirmation that these activities do exist among secondary school adolescents in Oyo State. Also, the very low ratings result which was constituted more by student respondents can be adduced to the respondents' population size of students as against that of staff. The students' population size being three hundred and ninety five (395) while that of teachers was fifty (50) is a significant factor for the wide difference in the ratings of very low and very high.

Despite the trend of very low ratings by respondents on the listed deviant behaviour activities, it was observed that very high ratings by respondents were recorded at par with very low ratings for using abusive language; not attending classes; and defacing/spoiling school property. Unlike the wide margin of difference that is recorded between very low and very high for majority of the items, items 5, 6 and 9 seem to have slightly reduced marginal difference (22.9% to 32.4%) considering that the three (3) items have over a hundred respondents responding in the negative and positive in relation to the items. The obtained result is an indication that although majority of the respondents which is made up of students are of the opinion that incidents in relation to these activities are

very low, a large number of respondents again largely dominated by students have contrary views that the occurrence or incidences of using abusive language, not attending classes; and defacing/spoiling school property is very high

4.1 DISCUSSION

Ratings for identified deviant behaviours exhibited among secondary school students

The undulating response rates in relation to the prevalence of the listed deviant behaviours, is an indication that exhibition of deviant behaviours among secondary school students is not uncommon. Although responses on prevalence of some of the deviant behaviours were rated as low, it is general knowledge that such deviant behaviours are rampant among secondary school students. The confirmation of the existence of deviant behaviours among secondary schools students in Oyo State corroborates the studies of Ngwokabuenui, 2015 and Nabiswa et al (2016). In both studies, commonly identified deviant behaviours among students included: boycotting of lessons; watching and practicing pornography; violence involving riots/protesting, fighting, assaulting, bullying and cultism; examination malpractice; disobeying constituted authority(ies); insulting/rudeness; substance abuse such as drugs and alcohol; vandalism and defacing of school walls; lateness to school; truancy such as boycotting school/classes, wearing wrong clothing to school; and lying and stealing.

From the list of identified deviant behaviours in the studies of Ngwokabuenui (2015) and Nabiswa et al. (2016), it can be seen that they all fall into the different sub categories of deviant behaviours i.e. drug related; physical and verbal related; and school and academic as categorised in the present study. Similar to the result of these studies, and in spite of the large population difference between staff and students, the present study which had a total of 445 respondents recorded very high response ratings for use of abusive language (108, 24.3%); not attending classes (117, 26.3%); and defacing/spoiling school property (102, 22.9%) under the physical and verbal; and school; and academic related deviant behaviours subcategories respectively.

For other rated deviant behaviours which had low ratings of prevalence, and are similar to those listed in the cited studies i.e. drug use, examination malpractice, sneaking out of school, disobedience to school authority and skipping school, high prevalence ratings of using abusive language; not attending classes; and defacing/spoiling school property (i.e. items 5, 6 and 9) was observed as having reduced margin difference ratings of very high as against very low, with a range of 22.9% to 32.4%. A total number of respondents which was over a hundred (100) rated the related items in the affirmative and otherwise. In line with Hanimoglu's (2018) categorisation of deviant behaviours, these highly rated deviant behaviours like other listed behaviours in the scale are negatively sanctioned deviant behaviours. They are considered as such because they are manifested character traits which are contrary to not only an established school system, but to the entire social system of the society

Furthermore, the response trend on using abusive language; not attending classes; and defacing/spoiling school property by majority of respondents which was made up by students implies that these behaviours are conspicuously exhibited; hence they are publicly witnessed, personally experienced or observed when meted out to fellow students. For other results on prevalence of the deviant behaviours investigated, population had significant influence on response ratings; hence the low response ratings in relation to behaviours which ordinarily are known to be highly prevalent. These low ratings can be adduced to student respondents not wanting to give the impression that such acts really do exist or that the prevalence rate is not high. The trend of low /very low response rating may also be due to the fact that some of the student respondents may not be aware of the rate at which some of the investigated deviant behaviours are exhibited by their classmates or students generally in their schools.

In all, the high ratings of deviant behaviour pose a threat to sustainable development. Youth restiveness has become a topical issue for discussion in the social, economic and polity domain in Nigeria. Akpokighe (2020) for instance noted that a country cannot thrive and progress significantly with youths who are restive and not otherwise positively engaged. Mba et al. (2021) also noted that the spiralling effect of In-School adolescent deviance in Nigeria are evident in drop-outs from school, ethnic militia, kidnapping, cultism, armed robbery, agitations and involvement in social insecurity. The causes and effects of In-School adolescent deviance therefore promote uncertainties which could lead to failure, fear and underdevelopment of most sectors in the country.

The findings of this study highlight the high prevalence of deviant behaviors among secondary school students in Oyo State, Nigeria. The behaviors were categorized into three main areas: drug-related, physical and verbal, and school and academic-related deviance. While some deviant behaviors were reported at lower rates by students, both staff and students agreed that certain behaviors, such as the use of abusive language, skipping classes, and defacing school property, are particularly common.

5.0 CONCLUSION

The results of this study, underscore the high prevalence of deviant behaviors among secondary school students in Oyo State, Nigeria. The significant difference in the ratings on deviant behaviours between staff and students is an indication that the prevalence or occurrence of such behaviours is higher among adolescents who mostly at the secondary schooling level of their education. The environment and situational factors also play a critical role in shaping behaviour as several programs have been shown to produce significant effects in mitigating deviancy among youths and this will benefit the goals of education in Nigeria.

5.1 RECOMMENDATIONS

1. The reality of deviant behaviours being manifested by secondary school students requires that the schools managements address the issue by creating awareness through group counselling e.g. short talks on the assembly to enlighten students who are not yet deviant; and/or individual/one-on-one counselling sessions for perpetrators of deviant behaviour(s).
2. Parents Teachers Association meetings and Open day sessions should be re-introduced where none existent any more, or should be re-structured in a way that will encourage parents to be more active and willing to work with the school on issues of deviant behaviours, especially concerning the children/wards.
3. The services of specific professionals in aspects of counselling such as general counselling, counselling psychology, career counselling, clinical counselling and psychologists should be employed to facilitate remediation in relation to specific deviant behaviour issues.
4. The government and school management should prioritise employing professional teachers with good qualifications and professional training on student-centred pedagogy and special development training so as to foster improved academic performance.

REFERENCES

Akpokighe, R., & Ejovi, A. (2020). Youth restiveness in Nigeria: Implications on sustainable national development. *UJAH: Unizik Journal of Arts and Humanities*, *21*(3), 66-89.

Anleu, S. R. (2023). Deviance, crime, and social control. In *Public Sociology* (pp. 338-360). Routledge.

Ayinde, O. & Olasehinde-Williams, F. A. O. (2020). Psychosocial problems and academic achievement of deviant pupils in basic schools in Oyo State, Nigeria. *Anatolian Journal of Education*, 5:1. Pps. 41-46. Retrieved 20 March, 2021 from https://files.eric.ed.gov/fulltext/EJ1249149.pdf

Ayuba, A. A. (2018). Quality control, teacher motivation and effectiveness in Kwara state public senior secondary schools (Master's thesis, Kwara State University, Nigeria).

Banda, M. & Mweemba, G. (2016). The nature of deviant behaviour patterns that are prevalent among pupils in secondary schools in Zambia: A case of Central Province. *International Journal of Humanities Social Sciences and Education (IJHSSE)* 3:10, Pp 57-64. Retrieved 7 Oct., 2019 from http://www.arcjournals.org

Barongo, V., Kiwale, Z., Shayo, E., Fabbri, C., Turner, E., Bakari, M., & Devries, K. (2024). Conceptualisation of violence and discipline among students, teachers, and parents in Nyarugusu Refugee Camp, Tanzania. *Child Abuse & Neglect*, *149*, 106555.

Bhatia, S., Pappo, A. S., Acquazzino, M., Allen-Rhoades, W. A., Barnett, M., Borinstein, S. C., & Hang, L. (2023). Adolescent and young adult (AYA) Oncology, Version 2.2024, NCCN clinical practice guidelines in oncology. *Journal of the National Comprehensive Cancer Network*, *21*(8), 851-880.

Bista, B. Thapa, P. Sapkota, D. Singh, S. B. & Pokharel P. K. (2016) Psychosocial problems among adolescent students: An exploratory study in the central region of Nepal. *Front. Public Health* 4:158 Retrieved 10 Jul. 2019 from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4972834/pdf/fpubh-04-00158.pdf

Dalhatu I. I. & Yunusa, A. A. (2013). Insight into delinquent and deviant behaviour among students of secondary school. *Scientific Journal of Pure and Applied Sciences* 2:5 Pps. 231-234. Retrieved 10 Jul. 2019 from https://www.researchgate.net/publication/307647558_Insight_into_delinqent_and_deviant_behaviour_among_students_of_secondary_school

Deepika, K. (2020). Multiple regression analysis of causative factors of deviant students and academic achievement among school students. *PalArch's Journal of Archaeology of Egypt/Egyptology*, *17*(7), 5139-5146.

Del Toro, J., & Wang, M. T. (2022). The roles of suspensions for minor infractions and school climate in predicting academic performance among adolescents. *American Psychologist*, *77*(2), 173.

Effiom, B. E., Undiyaundeye, F., Amalu, M. N., Undie, R. A., & Diwa, B. O. (2023). Factors influencing aggressive behaviour and academic performance

among senior secondary school students in Nigeria. *Res Militaris*, *13*(2), 2879-2893.

Gidado, B. K., & Diffang, A. D. (2023). Family dysfunction and parental role abdication as predisposing factors for drug abuse among secondary school adolescents and youths in the Federal Capital Territory, Abuja, Nigeria. *GPH-International Journal of Social Science and Humanities Research*, *6*(06), 01-12.

Hanimoglu, E. (2018). Deviant behavior in school setting. *Journal of Education and Training Studies*. 6:10 pps 133-141. Retrieved 13 Feb., 2020 from https://core.ac.uk/download/pdf/228083515.pdf

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*. Retrieved 20 March, 2021 from http://www.kenpro.org/sample-size-determination-using-krejcie and morgan-table

Mahome, M. M. (2024). Exploring the factors contributing towards teacher workplace bullying across the teaching ranks: Focus on selected South African public schools. *International Journal of Social Science Research and Review*, *7*(2), 36-64.

Mba, R. A., Ihejirika, J. C., & Deekor, H. L. (2021). Influence of youth restiveness on community development in Andoni and Opobo/Nkoro Local Government Areas of Rivers State. *International Journal of Innovative Psychology & Social Development*, *9*(1), 1-20.

Mbato, S. I., & Nkeiru, A. N. L. (2024). The role of education in the achievement of sustainable development in Nigeria. *Journal of Education in Developing Areas*, *31*(5), 135-143.

McCarty, J. D., DeDiego, A. C., Carrier, J. W., & Thompson-Ebanks, V. (2023). Self-reported reasons for college student attrition. *Journal of Applied Research in the Community College*, *30*(2), 33-50.

Musengimana, J., Kampire, E., & Ntawiha, P. (2021). Factors affecting secondary schools students' attitudes toward learning chemistry: A Review of literature. *EURASIA Journal of Mathematics, Science and Technology Education*, *17*(1).

Nabiswa, J., Bernard L. M. & Ferdinand N. M. (2016). Analysis of student deviant behaviour most prevalent in schools of Bungoma. *Quest Journals Journal of Research in Humanities and Social Science*.

Ngwokabuenui, P. Y. (2015). Students' Indiscipline: Types, Causes and Possible Solutions: The Case of Secondary Schools in Cameroon. Journal of Education and Practice. 6:22 Pps. 64 - 72. Retrieved 20 March, 2021 from http://www.iiste.org

Okolie, U. C., Igwe, P. A., Mong, I. K., Nwosu, H. E., Kanu, C., & Ojemuyide, C. C. (2022). Enhancing students' critical thinking skills through engagement with innovative pedagogical practices in Global South. *Higher Education Research & Development*, *41*(4), 1184-1198.

Oladipo I.E, Udoh-Emokhare C.E, & Oladipo T.D. (2023) Deviant behaviour and students' academic activities in Oyo State, Nigeria. *African Journal of Stability and Development, 15(1&2),* 93-113. https://doi.org/10.53982/ajsd.2023.1501_2.06-j

Rachel, C., Roman, N. V., & Donga, G. T. (2022). The contribution of parental factors to adolescents' deviant behaviour in South Africa: Evidence from three rural communities in South Africa. *Social Sciences*, *11*(4), 152.

Ugwu, C. J. & Diamond, S. (2017). Family dynamics as determinants of delinquent behaviours among in-school adolescents in Asaritoru Local Government Area of Rivers State, Nigeria. *International Journal of Academic Research and Reflection*, 5:4. Pps. 58-64. Retrieved 20 March, 2021 from https://www.idpublications.org/wp-content/uploads/2017/06/Full-Paper-FAMILY-DYNAMICS-AS-DETERMINANTS-OF-DELINQUENT-BEHAVIOURS-AMONG.pdf

UNICEF. (2021). The state of the global education crisis: a path to recovery: a joint UNESCO, UNICEF and WORLD BANK report. *Paris*: UNESCO, cop. 2021.

Vinney, C. (2019). Sutherland's differential association theory explained. *ThoughtCo*. Retrieved 10 Jul. 2019 from https://www.thoughtco.com/differential-association-theory-4689191.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

PROMOTING SUSTAINABLE SOLUTIONS FOR ADDRESSING SUBSTANCE USE DISORDER IN NIGERIA

Anthony Onyebuchi Onwudiwe
Department of Psychology, Chukwuemeka Odumegwu Ojukwu University Igbariam, Nigeria.
* somadinaonwudiwe@gmail.com

ABSTRACT
Substance Use Disorder (SUD) is a complex mental health condition that changes both the brains of the individuals involved in it and their behavior. This leads to a situation where they cannot control their use of drugs that are legal or illegal. In Nigeria, the prevalence of SUDs exceeds the global average, making it a significant public health challenge. This article aims to promote sustainable solutions for addressing SUDs in Nigeria, focusing on evidence-based treatments, addressing the social determinants of SUD, and community involvement. It was reported that up to 14.4% of Nigerians aged 15-64 years use drugs, with a projected increase of 130% by 2050 in sub-Saharan Africa. SUDs have dire consequences for the individuals involved, their families, and the entire society. The consequences also include increased risk of cardiovascular diseases, mental health disorders, liver damage, cognitive impairment, suicidal ideation, family breakdown, increased crime rates, and reduced productivity. Evidence-based treatments (EBTs) for SUDs include Medication-Assisted Treatment (MAT), Cognitive-Behavioral Therapy (CBT), and Contingency Management. Addressing the social determinants of SUD is crucial for sustainable solutions, as factors like unemployment, social stigma, poverty, and lack of education contribute to the development and perpetuation of SUDs. Community-based interventions, such as peer support groups, family therapy, and community education programs, can significantly help in the reduction of the stigma associated with SUDs and promote long-term recovery. Implementing sustainable solutions for SUDs in Nigeria requires a comprehensive approach that includes awareness campaigns, harm reduction strategies, accessible treatment services, policy reforms, and collaboration with stakeholders.

Keywords: *Community-based initiatives, Cultural adaptations, Evidence-based treatments, Substance Use Disorder (SUD), Sustainable solutions & Nigeria*

1.0 INTRODUCTION

Substance Use Disorder (SUD) is a complex yet treatable mental health condition that significantly changes an individual's brain and how he behaves, which leads to a situation where they cannot control how they use these legal or illegal drugs (Sultan et al., 2024). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders, commonly referred to as DSM-5, defines SUD as a pattern of symptoms caused by the use of substance(s) which an individual continues to take irrespective of the problems experienced from the use. This treatable mental health disorder changes brain function and behavior opening up an individual to the possibility of psychological and physical issues (Sultan et al., 2024). Before we go on, it is important to understand the range of issues termed SUDs in this work. SUD is a wide term that ranges from substance abuse to substance addiction (Esmail et al., 2021). Substance abuse may not be on the same level with substance addiction but it still comes with significant side effects. On the other hand, substance addiction is a chronic disease. So the use of the term SUD in this article refers to both substance abuse and substance addiction.

Having defined Substance Use Disorder, it becomes clear that Nigeria as country is battling with this. The need arises then to address substance use disorder in Nigeria and explore sustainable solutions to this. This requires a comprehensive approach which will include awareness campaigns, harm reduction strategies, community-based interventions, research, accessible treatment services, policy reforms, and collaboration with stakeholders. A good understanding of the impact of SUD will help us develop effective solutions that can take this SUD challenge head-on with high chances of success.

Many solutions have been advanced and implemented to address substance use disorder (SUD) in Nigeria. This is why it becomes pertinent that we explore sustainable solutions. These solutions prioritize evidence-based treatments, addressing the social determinants of SUD and community involvement. When these solutions are implemented, the society will have a chance of getting healthier, with the burden of SUD drastically reduced.

The primary aim of this work then is to promote sustainable solutions for addressing Substance Use Disorders in Nigeria. This work is not going to focus on solutions, but on solutions that can be sustained. The major area that needs to be addressed in SUDs is the relapse and recovery. Many solutions do not offer much

help in preventing the individuals involved in substance from relapsing. That is the gap the work will attempt to fill.

2.0 PREVALENCE AND CONSEQUENCES OF SUBSTANCE USE DISORDER IN NIGERIA

The 2016 global prevalence of drug use was reported to be 5.5% among those aged 15-64 years, as indicated by the World Drug Report (Chaouali et al., 2021). Sad enough, in 2018, the United Nations Office on Drug and Crime in Nigeria reported that 14.4 % or 14.3 million people aged between 15 and 64 years in Nigeria use drugs. This fact goes to show that the rate at which drugs are used in Nigeria far exceeds that of the global prevalence. Add this to the fact that there is a projected increase in the prevalence of SUDs in sub-Saharan Africa. This projection is expected to rise by 130% by 2050 (Jaguga & Kwobah, 2020). In itself this projection is concerning. Worse still when you consider the current challenges in the treatment and prevention systems, the need for immediate and effective interventions becomes evident. For emphasis sake, the prevalence of SUDs in Nigeria far exceeds the global average which makes it a significant public health challenge (Rotimi et al., 2022). Due to this escalating prevalence, it becomes paramount to address the need to employ comprehensive approaches in the treatment and intervention systems.

Evidence abounds in the literature that Nigeria has a significant public health concern occasioned by substance abuse. Starting with alcohol which has long been known as a social drug in some parts of Nigeria to other substances. Both traditional and modern drinks, such as palm wine, burukutu, and beer, play a significant role in social events like weddings, funerals, and chieftaincy title-taking (Obot, 2000; Okezie, 2020). But then, its patterns of consumption keep changing. Okezie (2020) discusses the cultural significance of alcohol in Nigeria which people now sometimes consume with other substances. Individuals of different age brackets from young adults to elderly ones indulge in alcohol. Alcohol is consumed with or without other substances. Olanrewaju (2022) reports that there is a high prevalence of drug and substance abuse among students in southwestern universities, with a significant 45.7% of students involved in substance abuse. Among the most commonly abused substances were syrup containing codeine, tramadol, alcohol, and cigarettes. The youths of Ejigbo community, Osun state are reported to have a prevalence of substance abuse at 12.3%, with shisha, tramadol, and alcohol as the most abused (Ajibola et al., 2023). Adesanya et al. (1997) conducted a study with the result that 6.6% of the subjects in Nigerian prisons use cannabis, and 42.3% of them met the criteria for dependence. The prevalence of drug abuse among secondary school students in the Awka Educational Zone of Anambra State was investigated with the result that a significant association exists between the type of school and the incidence of crystal methamphetamine use (Uzor et al., 2023). These studies suggest that substance abuse is a significant concern in Nigeria which impacts different segments of the population and the economy.

This condition has dire consequences for the individuals involved, their families their communities, and the society as a whole. In terms of the individual's health, it increases the risk of mental health disorders like depression (Davis et al., 2008; Soltan et al., 2013), anxiety (Sultan et al., 2024), and psychosis (Baldaçara et al., 2023) while also leading to cardiovascular diseases (Ciccirillo et al., 2022) and liver damage (Davis & Zhu, 2022). It also leads to cognitive impairment (Melugin et al., 2020) and suicidal ideation (López-Goñi et al., 2018). For the families of the individuals involved, it causes breakdown and dysfunction (Dawes et al., 1999). In the communities of the individuals involved, it increases the crime rate (Fazel, 2009; Andrews, 2012) and violence rate which affects productivity (Amin et al., 2023) and unemployment opportunities.

3.1 EVIDENCE-BASED TREATMENTS

Evidence-based treatments (EBTs) involve scientifically-backed approaches, based on extensive research with documented results (Kettlewell, 2004). In the context of SUDs, EBTs encompass therapies like Cognitive-Behavioral Therapy (CBT), Medication-Assisted Treatment (MAT), and Contingency Management. These treatments target the physical, emotional, and behavioral aspects of addiction (Ivanov et al., 2006). Implementing EBTs enables healthcare providers to deliver top-tier care, enhance treatment results, and support individuals in achieving lasting recovery and improved overall well-being. Let us take a brief look at them.

3.1. Cognitive-behavioral therapy (CBT) for SUD

Cognitive behavioral therapy (CBT) is a mental health treatment that has ample evidence of effectiveness in treating a variety of issues, such as depression (Lopez & Basco, 2010), anxiety disorders (Bergez et al., 2020; Kaczkurkin & Foa, 2015; Otte, 2011), substance abuse problems, marital difficulties (Morales et al., 2022), eating disorders (Westhoff et al., 2023), and severe mental illnesses (Randall & Finkelstein, 2007). Many studies have demonstrated that CBT can result in significant improvements in functioning and quality of life (Jang et al., 2013). In many other studies, CBT is just as effective, if not more effective, than other forms of psychological therapy or medications (Bennett, 2020). It

is pertinent to point out that advancements in CBT have been made through both research and clinical practice. CBT is a treatment approach that has a substantial amount of scientific evidence supporting its effectiveness in producing change. This sets CBT apart from many other forms of psychological treatment.

CBT has several fundamental assumptions, among which are:

i. Psychological issues are, to a certain extent, rooted in flawed or counterproductive patterns of thinking.
ii. Psychological issues are, to a certain extent, rooted in ingrained behaviors that are not helpful.
iii. Individuals struggling with psychological issues have the potential to acquire healthier coping mechanisms, which can alleviate their symptoms and enable them to lead more successful lives.

Cognitive Behavioral Therapy (CBT) aims to transform harmful thinking patterns and behaviors. Initially, individuals are taught to identify distorted thinking patterns that contribute to their problems and reevaluate these patterns in light of reality, fostering a more balanced perspective.CBT also helps individuals gain insight into understanding others' behavior and motivations, develop problem-solving skills to navigate challenging situations and build confidence in their abilities. This newfound self-awareness and understanding enable individuals to make positive changes in their lives. In addition to cognitive shifts, CBT addresses behavioral changes. Individuals learn to confront their fears and anxieties directly, rather than avoiding them. Role-playing prepares them for potentially difficult interactions, and mastering relaxation techniques helps to calm the mind and body.

The efficacy of Cognitive-Behavioral Therapy (CBT) for treating alcohol and substance use disorders is well-documented in the literature. Large-scale trials and meta-analyses have consistently shown that CBT is effective in reducing substance use and improving treatment outcomes (Attiah, 2023; Cho & Lee, 2020; Kiluk, 2019; Magill et al., 2019). For instance, internet-based CBT (I-CBT) has been found to significantly reduce alcohol consumption compared to control groups (Cho & Lee, 2020). Similarly, CBT has demonstrated efficacy against minimal, nonspecific, and specific therapies for substance use disorders, with significant effects observed particularly at early follow-up time points (Magill et al., 2019).

3.2. Motivational Interviewing (MI)

Motivational Interviewing focuses on addressing ambivalence about change in a person-centered manner (Hettema et al., 2005; Miller & Rollnick, 2004). Ambivalence here involves the mixed or conflicting feelings, thoughts, and motivations about behavior change that an individual has, especially with regard to substance use or other harmful habits. MI is grounded in the principles of eliciting the client's motivations for change, rather than imposing external motivations (Hettema et al., 2005). This approach, which was first described by William R. Miller in 1983, has been refined through clinical experience and empirical research. It now stands in its right as a practice that is evidence-based in the treatment of individuals with substance use disorders. It is different from more coercive or externally driven methods since it does not force the individual to change in a way seen as inconsistent with his wishes, values or beliefs. What it does is to support change in a way that is consistent with the person's values and beliefs. The method focuses on the exploration and resolution of ambivalence and on the motivational processes within the individual that bring change.

Motivational Interviewing (MI) has a substantial body of research supporting its efficacy in the treatment of SUD. MI is effective in treating individuals with SUDs (DiClemente et al., 2017; Miller et al., 2014). It was introduced in the 1980s and since then, many clinical trials have shown its effectiveness in treating a range of issues related to SUD. A meta-analysis of 72 clinical trials observed that it can help individuals quit smoking (Rubak et al., 2005). Also, a review of 39 studies revealed that two-thirds of the studies found that it helped adolescents reduce substance use significantly (Barnett et al., 2012). Yet another review suggests that it can be effective in helping people reduce binge drinking and the frequency of alcohol they consume (Frost et al., 2018).

3.3. Medication-Assisted Treatment (MAT)

This is a combination of pharmacological interventions and behavioral therapies when treating SUDs. This model of treating SUDs addresses the physical aspects of dependence while promoting psychological and emotional well-being all to sustain long-term recovery and improve the quality of life (Andraka-Christou, 2016; Mcelrath & Joseph, 2017). Its effectiveness in treating chronic alcohol and drug disorders is supported by evidence (Rieckmann et al., 2010). It is a tool proven to aid patients, in experiencing withdrawal safely. It is also part of a treatment strategy that includes FDA-approved medications and aims to treat opioid, alcohol, or tobacco use disorders (Daley & Douaihy, 2019).

Medication-assisted treatment (MAT) is aimed at reducing withdrawal symptoms and cravings, managing addiction symptoms, and promoting long-term recovery and quality of life (Arms et al., 2022; Carter et al., 2023).

3.4. Family and group therapies

Family and group therapies are also recognized as evidence-based treatments for substance use disorders

(SUDs). There are varieties of approaches that are empirically supported. Family-based therapies such as family training, marital/couples therapy, and community reinforcement have been recognized for their effectiveness in treating SUDs (Meyers et al., 2002). For instance, multidimensional family therapy (MDFT) has been proven to be especially effective for adolescent substance abuse because it addresses both individual behavior and within-family interactions and the wider social systems (Liddle & Hogue, 2001). Similarly, group therapies like network therapy and 12-step groups are recognized as primary psychological interventions for substance abusers (Brook & Spitz, 2013). Group therapy is recognized for its effectiveness and cost-effectiveness, with different approaches being utilized depending on the patient population and the treatment setting (Brook & Spitz, 2013).

4.0 CULTURAL ADAPTATIONS AND CONSIDERATIONS

Consideration of cultural differences is vital when it comes to treating substance use disorders in Nigeria. With over 250 ethnic groups (Nnamdi, 2022; Oba, 2002) and a variety of religious beliefs and practices, treatment programs must be sensitive to cultural nuances. We must not also ignore the fact that language may also be a barrier in the treatment of substance use disorders, with over 500 (Igudia, 2023) languages spoken in the country. Treatment programs should provide services in local languages to ensure accessibility.

Nigeria's traditional healing practices, such as herbalism (Eruaga et al., 2024) and spiritual healing, can be integrated into treatment programs. Family and community involvement is crucial in Nigerian culture, where strong family and community ties exist. Treatment programs must engage family members and community leaders to ensure effective support.

Finally, proper engagement with traditional leaders, such as chiefs and emirs, and religious leaders such as pastors and imams can enhance the effectiveness of treatment programs. Community-based initiatives, including peer support groups and outreach programs, are also essential in Nigeria.

5.0 SUSTAINABLE SOLUTIONS

To effectively address SUDs in Nigeria, we must consider a comprehensive approach that will involve more than just treatment and recovery (Alonazi et al., 2024). It requires sustainable solutions that focus on the importance of long-term effects, community involvement, and the general well-being of the individual. These sustainable solutions include:

5.1. Task-shifting and task-sharing models

The task-shifting model is a model of healthcare delivery that encompasses the shifting or redistribution of tasks among workforce teams. It is a response to workforce shortages and aims to make efficient use of human resources by delegating tasks from highly specialized professionals to those with less specialized training (Das et al., 2023; Leong et al., 2021; Tuyl et al., 2021). This model has been applied in various contexts, including primary care, where it has shown the potential to improve health outcomes and achieve cost savings (Leong et al., 2021). This model has been recognized as a potential strategy for addressing substance use disorders (SUDs). It can be of immense help in reducing the effect of the shortage of specialized healthcare providers. What it achieves is to enable less specialized health workers to deliver care under supervision (Ernst et al., 2007).

The adoption of task-shifting and task-sharing models in Nigeria will increase access to SUD care in underserved communities and this will significantly enhance community engagement and reduce the workload for specialized healthcare professionals (Das et al., 2023). These models are cost-effective, sustainable, and have the potential to improve patient outcomes and recovery rates.

Within the context of Nigeria, examples of task-shifting and task-sharing models can include training community health workers to provide basic SUD care, collaborative care between psychiatrists and primary care physicians, and involving traditional healers and spiritual leaders in SUD care.

5.2. Telepsychology and digital interventions

Telepsychology is the practice of using telecommunications technology to deliver psychological services. This has been recognized as a good alternative to face-to-face therapy, especially in reaching rural and remote populations (Simpson & Reid, 2014). Some studies show that telepsychology can be as effective as in-person therapy, with clients reporting high satisfaction and therapeutic rapport (Simpson & Reid, 2014). Digital interventions in healthcare, involve a wide range of technologies and applications intending to improve service delivery and health outcomes. These interventions include telemedicine, eHealth, and mobile health (mHealth) solutions, which are designed to enhance the accessibility, efficiency, and quality of healthcare services (Carpio-Delgado et al., 2023).

Both telepsychology and digital interventions are potential sustainable solutions for addressing the challenges of SUDs in Nigeria. These can provide cost-effective and accessible options for treatment especially in areas where healthcare resources are limited and with

a recognised high level of stigma. Many factors influence the increase of substance use among Nigerian youths as identified in the study of undergraduates in private universities (Taye et al., 2021). The integration of telepsychology could potentially address these factors. Again, digital interventions may offer new ways to communicate behavioral changes and support the recommendations for efforts to eradicate substance abuse for sustainable human development (Taye et al., 2021) These innovative approaches provide increased accessibility, and convenience (Ftanou et al., 2024), confidentiality, cost-effectiveness, and scalability (Härter et al., 2019), making them ideal for Nigeria's diverse population.

5.3. Collaborations with traditional healers

The World Health Organisation reports that a significant part (80%) of the world population consults traditional healers. This suggests the potential for traditional healers to contribute to a culturally sensitive clinical practice (Adekson, 2016). With this report, the possibility of integrating these traditional healers as a sustainable solution to addressing SUDs in Nigeria becomes obvious. This is because, these traditional healers are easily accessible and culturally accepted within local communities (Rao, 2020). They are recognized for their role in treating various health issues, including substance abuse, and are accepted by the communities they serve (Rao, 2020).

A collaboration with these traditional healers could provide a sustainable solution for tackling SUDs in Nigeria considering that they have a deep knowledge of the local beliefs and practices of the the communities they serve. This allows them to establish a connection with the community members on a cultural level. The existing relationship they already have with the community members encourages trust between them and this makes them ideal partners for delivering SUD care.

Anjorin and Wada (2022) discuss the substantial role of traditional healers in mental health service provision in Nigeria, suggesting a common practice of consulting these healers. Jidong et al. (2021) also highlight the pattern of consulting traditional healers before seeking psychiatric care in Nigeria.

5.4. Spiritually Integrated Psychotherapy

Spiritually Integrated Psychotherapy (SIP) is an approach to therapy that acknowledges the importance of an individual's spiritual/religious beliefs and practices. SIP does not just acknowledge these beliefs and practices but incorporates them into the psychotherapeutic process to align with the values of the client and enhance treatment outcomes (Pargäment, 2008; Rosmarin et al., 2011). Spiritually Integrated Psychotherapy (SIP) involves adapting secular psychotherapies to include spiritual content. This is very effective in treating different mental disorders (Rosmarin et al., 2021). SIP can be particularly effective in contexts where spirituality plays a s significant part in the lives of individuals (Rosmarin et al., 2021). It is commonly known that spirituality and religiosity play a huge part in the lives of Nigerians (Nasidi et al., 2022). Due to that fact, it should be looked into as a potentially sustainable solution for addressing SUDs in Nigeria. Every individual has his/her values and beliefs. SIP is sensitive to the values and beliefs of individuals who hold religious/spiritual beliefs and makes use of elements like prayer, meditation, and spiritual coping mechanisms to help the individual (Rosmarin et al., 2011; Santiago & Gall, 2016). Adewuya and Makanjuola (2009) revealed that a majority of mentally ill patients in southwestern Nigeria have a preference for spiritual healers. This goes to show that Nigerians trust their spiritual healers. If that is the case, then these spiritual healers should not be discarded totally. They should somehow be integrated into a comprehensive program that would address the issue of SUD.

Evidence suggests that spirituality when integrated into treatment programs can positively influence recovery outcomes (DiReda, 2016; Lyons et al., 2010). Faith-based programs and other spiritual approaches have been associated with a reduction in the severity of substance abuse and improved maintenance of recovery (Shamsalina et al., 2014). Studies indicate that spirituality can play a significant role in the recovery of substance abusers (Shamsalina et al., 2014). Interestingly, a significant portion of addiction treatment programs in the USA use spirituality-based elements that contribute to prevention and recovery (Grim & Grim, 2019). Some of these faith-based programs are oftentimes rooted in Christian belief systems with the position that addiction is the consequence of a spiritual void. But then secular programs may also acknowledge the role of spirituality while emphasizing the biological, environmental, and psychological factors (Mccoy et al., 2005).

6.0 TRAINING AND CAPACITY BUILDING

The individuals and groups must be trained to provide mental health services to the Nigerian population. Given that we are advocating for task-shifting and task-sharing, it becomes necessary to also advocate that the less-specialized personnel to whom the task of caring for patients with SUD issues be properly trained. This is very necessary given the high prevalence of psychiatric disorders and the limited availability of mental health care facilities and professionals (Kayode, 2014). that

notwithstanding, stakeholders should also ensure that cultural sensitivity, trauma-informed care, relapse prevention, and recovery strategies are essential components of this training. Mental healthcare professionals like psychologists, psychiatrists, counselors, nurses, medical doctors, and community health workers should also undergo periodic training which includes workshops, online courses, mentorship programs, and supervised clinical practice.

Moreover, Community-based training programs are essential for sustainable solutions to substance use disorders (SUDs), as they can be tailored to meet the specific needs of local populations and ensure relevance and effectiveness (Alonazi et al., 2024). Such programs can incorporate elements of public health policies, legislative measures, and public education campaigns, which have been successful in reducing substance abuse in other contexts (Alonazi et al., 2024). These programs provide empowerment to community members and enhance community-based support systems and grassroots initiatives all of which address the social determinants of health. They include programs like community outreach, engagement, family support group facilitation, youth-focused initiatives, community-based counseling services, and referral systems to healthcare services. The programs aim to increase community awareness, enhance community capacity, improve access to support services, empower community members, provide sustainable solutions, ensure cultural relevance, foster social support networks, involve families, adopt holistic approaches, and establish effective referral systems.

7.0 CONCLUSION

In summary, tackling Substance Use Disorders (SUDs) in Nigeria necessitates a multifaceted strategy that incorporates evidence-based therapies, culturally sensitive adaptations, and long-term solutions. The high prevalence of SUDs in Nigeria demands a comprehensive response that employs community-based initiatives, task-shifting models, telepsychology, and collaborations with traditional healers. By integrating these approaches, Nigeria can enhance access to SUD care, reduce stigma, and foster lasting recovery.

Effective solutions must consider Nigeria's diverse cultural landscape, language barriers, and strong family and community ties. Task-shifting and task-sharing models can increase access to SUD care, while telepsychology and digital interventions offer cost-effective and confidential options. Collaborations with traditional healers and spiritually integrated psychotherapy can further enhance cultural sensitivity and treatment outcomes.

Training and capacity building are essential components of sustainable solutions. It is crucial to provide ongoing training for mental health professionals, community health workers, and traditional healers to ensure cultural sensitivity, trauma-informed care, and relapse prevention strategies. Community-based training programs empower community members, strengthen support systems, and address social determinants of health.

Ultimately, a comprehensive approach that combines evidence-based treatments, culturally sensitive adaptations, and sustainable solutions can effectively address SUDs in Nigeria. By prioritizing community involvement, cultural sensitivity, and innovative solutions, Nigeria can reduce the burden of SUDs, promote long-term recovery, and enhance overall well-being. Stakeholders must collaborate to implement these solutions, ensuring a healthier and more sustainable future for Nigerians affected by SUDs.

REFERENCES

Adekson, M. O. (2016). Similarities and Differences Between Yoruba Traditional Healers (YTH) and Native American and Canadian Healers (NACH). Journal of Religion and Health, 55(5), 1717–1728. https://doi.org/10.1007/s10943-016-0251-6

Adesanya, A., Ohaeri, J. U., Ogunlesi, A. O., Adamson, T. A., & Odejide, O. A. (1997). Psychoactive substance abuse among inmates of a Nigerian prison population. Drug and Alcohol Dependence, 47(1), 39–44.

Adewuya, A., & Makanjuola, R. (2009). Preferred Treatment for Mental Illness Among Southwestern Nigerians. Psychiatric Services, 60(1), 121–124. https://doi.org/10.1176/ps.2009.60.1.121

Ahmed Kayode, O. (2014). Using e-psychiatry to Scale up Mental Health Services in Nigeria. Journal of Mass Communication & Journalism, 04(04). https://doi.org/10.4172/2165-7912.1000184

Ajibola, I., Oluwaseye, A., Oluwaseyi, O., Loliya, A., Omotolani, O., Ayomikun, O., Olumide, A., Ayodele Olatayo, A., Ebunoluwa, O., Anatasia, M., Jesulayomi, E., Gloria, E., Daniella, A., Victoria, A., Emmanuel, O., Blessing, A., & Ibukun Mary, A. (2023). Prevalence, pattern and determinants of substance abuse among youths in a rural community of Osun State, Southwest Nigeria. *African Health Sciences*, *23*(4), 563–574. https://doi.org/10.4314/ahs.v23i4.59

Alonazi, A. K., Almutairi, F. M., Aljandabi, A. M., Alanazi, B. A., Alruwaili, D. F., Mutairi, A. O. A., Alzahrani, Z. M., Alsaif, S. M., & Alanazi, M. S. (2024). The impact of public health policies on reducing tobacco and substance abuse among the community. *International Journal Of Community*

Medicine And Public Health, *11*(8), 3235–3239. https://doi.org/10.18203/2394-6040.ijcmph20241977

Alonazi, A. K., Almutairi, F. M., Aljandabi, A. M., Alanazi, B. A., Alruwaili, D. F., Mutairi, A. O. A., Alzahrani, Z. M., Alsaif, S. M., & Alanazi, M. S. (2024). The impact of public health policies on reducing tobacco and substance abuse among the community. International Journal Of Community Medicine And Public Health, 11(8), 3235–3239. https://doi.org/10.18203/2394-6040.ijcmph20241977

Alya Attiah, A. (2023). Cognitive behavioral therapy treatment for drug addiction. *Journal of Addiction Therapy and Research*, *7*(1), 005–007. https://doi.org/10.29328/journal.jatr.1001025

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington, VA: APA, 2013.

Amin, U., Amin, I., Jan, R., & Malla, A. M. (2023). Substance Abuse: A Public Health Concern. *Indian Journal of Psychiatric Nursing*, *20*(2), 168–178. https://doi.org/10.4103/iopn.iopn_25_23

Andraka-Christou, B. T. (2016). Essay: Improving Drug Courts Through Medication-Assisted Treatment for Addiction. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2779650

Andrews, D. (2012). Chapter 9 - Substance Abuse. In The Psychology of Criminal Conduct (pp. 275–295). elsevier. https://doi.org/10.1016/b978-1-4224-6329-1.50014-2

Arms, L., Demartini, J., & Johl, H. (2022). Improving the utilisation of medication-assisted treatment for alcohol use disorder at discharge. *BMJ Open Quality*, *11*(4), e001899. https://doi.org/10.1136/bmjoq-2022-001899

Baldaçara, L., Ramos, A., & Castaldelli-Maia, J. M. (2023). Managing drug-induced psychosis. In *International Review of Psychiatry: Vol. ahead-of-print* (Issue ahead-of-print, pp. 496–502). taylor francis. https://doi.org/10.1080/09540261.2023.2261544

Barnett E, Sussman S, Smith C, Rohrbach L, Spruijt-Metz D. Motivational interviewing for adolescent substance use: A review of the literature. *Addict Behav*. 2012;37(12):1325-1334. doi:10.1016/j.addbeh.2012.07.001

Bennett, D. (2020). Cognitive-Behavioral Therapy for Insomnia (CBT-I) (pp. 47–66). springer. https://doi.org/10.1007/978-3-030-44447-1_3

Bergez, K. C., Ramirez, A. C., Grebe, S. C., Perez, M. I., Viana, A. G., Storch, E. A., & Schneider, S. C. (2020). Chapter 2 - Efficacy of exposure-based cognitive behavioral therapy for youth anxiety and obsessive-compulsive disorder. In Exposure Therapy for Children with Anxiety and OCD (pp. 21–37). elsevier. https://doi.org/10.1016/b978-0-12-815915-6.00002-0

Brook, D. W., & Spitz, H. I. (2013). *The Group Therapy of Substance Abuse*. crc. https://doi.org/10.4324/9781439807125

Carpio-Delgado, F. D., Mamani-Laura, M. R., Espiritu-Martinez, A. P., Aguilar-Cruzado, J. L., Bernedo-Moreira, D. H., Romero-Carazas, R., & Joo-García, C. E. (2023). Telemedicine and eHealth Solutions in Clinical Practice. *EAI Endorsed Transactions on Pervasive Health and Technology*, *9*. https://doi.org/10.4108/eetpht.9.4272

Carter, M., Bennett, T., Boyd, J., & Baus, A. (2023). Medication Assisted Treatment Program Policies: Opinions of People in Treatment. *Journal of Primary Care & Community Health*, *14*. https://doi.org/10.1177/21501319231195606

Chaouali, N., Amira, D., Salem, K. B., Hedhili, A., Salah, N. B., & Moslah, B. (2021). Illicit substances identified in the urine of 11.170 suspected drug users in North Tunisia. *The Pan African Medical Journal*, *38*(2). https://doi.org/10.11604/pamj.2021.38.20.26781

Cho, S.-H., & Lee, Y. K. (2020). *Internet-based cognitive-behavioral therapy (I-CBT) for problem drinkers: systematic review and meta-analysis (Preprint)*. jmir. https://doi.org/10.2196/preprints.18113

Ciccirillo, F., Morici, N., Giallauria, F., Santucci, A., Caldarola, P., Cocozza, S., Boschini, A., Amico, A. F., Gulizia, M. M., Grosseto, D., Abrignani, M. G., Gabrielli, D., Gabriele, M., & Colivicchi, F. (2022). Substance abuse and cardiovascular risk: cocaine. *Giornale Italiano Di Cardiologia (2006)*, *23*(6), 444–453. https://doi.org/10.1714/3810.37941

Daley, D. C., & Douaihy, A. (2019). *Medications for Substance Use Disorders* (pp. 113–124). oxford university. https://doi.org/10.1093/med-psych/9780190926670.003.0015

Das, S., Grant, L., & Fernandes, G. (2023). Task shifting healthcare services in the post-COVID world: A scoping review. *PLOS Global Public Health*, *3*(12), e0001712. https://doi.org/10.1371/journal.pgph.0001712

Davis, L., Uezato, A., Frazier, E., & Newell, J. M. (2008). Major depression and comorbid substance use disorders. *Current Opinion in Psychiatry*, *21*(1), 14–18. https://doi.org/10.1097/yco.0b013e3282f32408

Davis, S., & Zhu, J. (2022). Substance abuse and neurotransmission. *Advances in Pharmacology*

(San Diego, Calif.), *93*, 403–441. https://doi.org/10.1016/bs.apha.2021.10.007

Dawes, M. A., Dorn, L. D., Moss, H. B., Yao, J. K., Kirisci, L., Ammerman, R. T., & Tarter, R. E. (1999). Hormonal and behavioral homeostasis in boys at risk for substance abuse. *Drug and Alcohol Dependence*, *55*(1–2), 165–176. https://doi.org/10.1016/s0376-8716(99)00003-4

DiClemente, C. C., Corno, C. M., Graydon, M. M., Wiprovnick, A. E., & Knoblach, D. J. (2017). Motivational interviewing, enhancement, and brief interventions over the last decade: A review of reviews of efficacy and effectiveness. Psychology of Addictive Behaviors, 31(8), 862–887. doi:10.1037/adb0000318

DiReda, J. (2016). The Role of Spirituality in Treating Substance Use Disorders. *Journal of Psychology & Clinical Psychiatry*, *6*(4). https://doi.org/10.15406/jpcpy.2016.06.00365

Ernst, D., Miller, W. R., & Rollnick, S. (2007). Treating substance abuse in primary care: a demonstration project. *International Journal of Integrated Care*, *7*(4). https://doi.org/10.5334/ijic.213

Eruaga, M., Bature, J., & Itua, E. (2024). Exploring herbal medicine regulation in Nigeria: Balancing traditional practices with modern standards. GSC Advanced Research and Reviews, 18(3), 083–090. https://doi.org/10.30574/gscarr.2024.18.3.0094

Esmail, M. E., Alnashry, A. M., Mosly, M. D., Abdulrahim, S. S., Alshahrani, K. A., Alalsaba, A. S., Akakah, B. A., Salamah, N. H., Alghamdi, A. A., Hakami, A. H., & Majrashi, A. A. (2021). Substance abuse, drug addiction and the role of primary health care amid the COVID-19 pandemic. International Journal of Community Medicine and Public Health, 8(12), 6175.

Fazel, S. (2009). Schizophrenia, Substance Abuse, and Violent Crime. JAMA, 301(19). https://doi.org/10.1001/jama.2009.675

Ftanou, M., Machlin, A., Mangelsdorf, S. N., Morgan, A., & Bassilios, B. (2024). Australian Digital Mental Health Services: Consumer Perceptions of Their Usability and Acceptability. *Journal of Technology in Behavioral Science*. https://doi.org/10.1007/s41347-024-00431-9

Grim, B. J., & Grim, M. E. (2019). Belief, Behavior, and Belonging: How Faith is Indispensable in Preventing and Recovering from Substance Abuse. *Journal of Religion and Health*, *58*(5), 1713–1750. https://doi.org/10.1007/s10943-019-00876-w

Hettema, J., Steele, J., & Miller, W. R. (2005). Motivational Interviewing. *Annual Review of Clinical Psychology*, *1*(1), 91–111. https://doi.org/10.1146/annurev.clinpsy.1.102803.143833

Igudia, O. E. (2023). Language Politics, Development, and Sustainability of Publishing and Textbooks in the Nigerian Languages (pp. 27–48). springer nature singapore. https://doi.org/10.1007/978-981-99-0305-4_3

Ivanov, I. S., Palmero, R. C., Newcorn, J. H., & Schuiz, K. P. (2006). Neurorobiology and Evidence-Based Biological Treatments for Substance Abuse Disorders. CNS Spectrums, 11(11), 864–877. https://doi.org/10.1017/s1092852900015017

Jang, C. H., Oh, D. H., & Kim, S. H. (2013). Cognitive Behavioral Therapy of Insomnia. Hanyang Medical Reviews, 33(4), 210. https://doi.org/10.7599/hmr.2013.33.4.210

Jidong, D. E., Ikhile, D., Gibson, L., Musoke, D., Bailey, D., Madhombiro, M., Sodi, T., Sawadogo, N., & Mbah, M. (2021). Nigerian cultural beliefs about mental health conditions and traditional healing: a qualitative study. The Journal of Mental Health Training, Education and Practice, 16(4), 285–299. https://doi.org/10.1108/jmhtep-08-2020-0057

Kaczkurkin, A. N., & Foa, E. B. (2015). Cognitive-behavioral therapy for anxiety disorders: an update on the empirical evidence. Dialogues in Clinical Neuroscience, 17(3), 337–346. https://doi.org/10.31887/dcns.2015.17.3/akaczkurkin

Kettlewell, P. W. (2004). Development, Dissemination, and Implementation of Evidence-Based Treatments: Commentary. Clinical Psychology: Science and Practice, 11(2), 190–195. https://doi.org/10.1093/clipsy.bph071

Kiluk, B. D. (2019). Computerized Cognitive Behavioral Therapy for Substance Use Disorders: A Summary of the Evidence and Potential Mechanisms of Behavior Change. *Perspectives on Behavior Science*, *42*(3), 465–478. https://doi.org/10.1007/s40614-019-00205-2

Magill, M., Carroll, K., Bernstein, M., Hoadley, A., Ray, L., Kiluk, B., & Tonigan, J. S. (2019). A meta-analysis of cognitive-behavioral therapy for alcohol or other drug use disorders: Treatment efficacy by contrast condition. *Journal of Consulting and Clinical Psychology*, *87*(12), 1093–1105. https://doi.org/10.1037/ccp0000447

Leong, S. L., Teoh, S. L., Fun, W. H., & Lee, S. W. H. (2021). Task shifting in primary care to tackle healthcare worker shortages: An umbrella review. *European Journal of General Practice*, *27*(1), 198–210. https://doi.org/10.1080/13814788.2021.1954616

Liddle, H. A., & Hogue, A. (2001). Chapter 11 - Multidimensional Family Therapy for Adolescent Substance Abuse. In *Innovations in Adolescent Substance Abuse Interventions* (pp. 229–261). https://doi.org/10.1016/b978-008043577-0/50031-6

Meyers, R. J., Apodaca, T. R., Slesnick, N., & Flicker, S. M. (2002). Evidence-Based Approaches for the Treatment of Substance Abusers by Involving Family Members. *The Family Journal*, *10*(3), 281–288. https://doi.org/10.1177/10680702010003004

Lopez, M. A., & Basco, M. R. (2010). Feasibility of Dissemination of Cognitive Behavioral Therapy to Texas Community Mental Health Centers. The Journal of Behavioral Health Services & Research, 38(1), 91–104. https://doi.org/10.1007/s11414-009-9209-8

López-Goñi, J. J., Fernández-Montalvo, J., Arteaga, A., & Haro, B. (2018). Suicidal ideation and attempts in patients who seek treatment for substance use disorder. *Psychiatry Research*, *269*, 542–548. https://doi.org/10.1016/j.psychres.2018.08.100

Lyons, G. C. B., Deane, F. P., & Kelly, P. J. (2010). Forgiveness and purpose in life as spiritual mechanisms of recovery from substance use disorders. *Addiction Research & Theory*, *18*(5), 528–543. https://doi.org/10.3109/16066351003660619

Mccoy, L. K., Hermos, J. A., Bokhourm, B. G., & Frayne, S. M. (2005). Conceptual Bases of Christian, Faith-Based Substance Abuse Rehabilitation Programs. *Substance Abuse*, *25*(3), 1–11. https://doi.org/10.1300/j465v25n03_01

Mcelrath, K., & Joseph, H. (2017). Medication-Assisted Treatment (MAT) for Opioid Addiction: Introduction to the Special Issue. *Substance Use & Misuse*, *53*(2), 177–180. https://doi.org/10.1080/10826084.2017.1404106

Melugin, P. R., Siciliano, C. A., & Nolan, S. O. (2020). Bidirectional causality between addiction and cognitive deficits. *International Review of Neurobiology*, *157*, 371–407. https://doi.org/10.1016/bs.irn.2020.11.001

Miller, W. R., & Rollnick, S. (2004). Talking Oneself Into Change: Motivational Interviewing, Stages of Change, and Therapeutic Process. *Journal of Cognitive Psychotherapy*, *18*(4), 299–308. https://doi.org/10.1891/jcop.18.4.299.64003

Miller, W. R., & Rollnick, S. (2014). The effectiveness and ineffectiveness of complex behavioral interventions: Impact of treatment fidelity. Contemporary Clinical Trials, 37(2), 234–241. doi:10.1016/j.cct.2014.01.005

Morales, C., Luks, K. L., & Sibrava, N. J. (2022). Cognitive-behavioral therapy. In Reference Module in Neuroscience and Biobehavioral Psychology (pp. 438–447). elsevier. https://doi.org/10.1016/b978-0-323-91497-0.00206-x

Nasidi, N. A., & Nasiru, M. A. (2022). The manipulation of religion in Nigeria, 1977-1987, Yusufu Bala Usman (Zaria: Yusufu Bala Usman Institute, 2020), 166 pp. ISBN-978-978-2557-08-7, Price: N1,500 ($3.60). Integrity Journal of Arts and Humanities, 3(2), 17–18. https://doi.org/10.31248/ijah2022.045

Nnamdi, N. (2022). An Exigent Tool to Curb Intercultural Conflicts in Nigeria. Journal of Central and Eastern European African Studies, 2(4), 3–21. https://doi.org/10.59569/jceeas.2022.2.4.106

Oba, A. (2002). Islamic Law as Customary Law: The Changing Perspective in Nigeria. International and Comparative Law Quarterly, 51(4), 817–850. https://doi.org/10.1093/iclq/51.4.817

Obot, I. S. (2000). The measurement of drinking patterns and alcohol problems in Nigeria. Journal of Substance Abuse, 12(1–2), 169–181.

Okezie, P. (2020). The Rising Effect of Alcohol and Substance Abuse in Nigeria. SSRN.

Olanrewaju, J. A., Enya, J. I., Olanrewaju, I., Owolabi, J. O., Osuoya, Q., Johnson, B. S., Feyisike Johnson, O., Hamzat, E. O., Udekwu, M. O., & Bamidele, R. (2022). An assessment of drug and substance abuse prevalence: a cross-sectional study among undergraduates in selected southwestern universities in Nigeria. *The Journal of International Medical Research*, *50*(10), 030006052211300. https://doi.org/10.1177/03000605221130039

Otte, C. (2011). Cognitive behavioral therapy in anxiety disorders: current state of the evidence. Dialogues in Clinical Neuroscience, 13(4), 413–421. https://doi.org/10.31887/dcns.2011.13.4/cotte

Pargäment, K. (2008). Spiritually integrated psychotherapy: understanding and addressing the sacred. Choice Reviews Online, 45(06), 45–3493.

Randall, M., & Finkelstein, S. H. (2007). Integration of Cognitive Behavioral Therapy into Psychiatric Rehabilitation Day Programming. Psychiatric Rehabilitation Journal, 30(3), 199–206. https://doi.org/10.2975/30.3.2007.199.206

Rao, P. D. (2020). Traditional Health Healers, Mental Illness and Substance Abuse: A Study Among Hausa-Fulani of Jigawa State in Nigeria. STUDIES ON ETHNO-MEDICINE, 14(3–4). https://doi.org/10.31901/24566772.2020/14.3-4.601

Rieckmann, T., Kovas, A. E., & Rutkowski, B. A. (2010). Adoption of Medications in Substance Abuse Treatment: Priorities and Strategies of Single

State Authorities. *Journal of Psychoactive Drugs*, *42*(sup6), 227–238. https://doi.org/10.1080/02791072.2010.10400546

Rosmarin, D. H., Bigda-Peyton, J. S., Björgvinsson, T., Auerbach, R. P., & Levendusky, P. G. (2011). Integrating Spirituality Into Cognitive Behavioral Therapy in an Acute Psychiatric Setting: A Pilot Study. Journal of Cognitive Psychotherapy, 25(4), 287–303.

Rosmarin, D. H., Costa, M. D. A., Moreira-Almeida, A., Bhugra, D., & Mosqueiro, B. P. (2021). Spiritually integrated psychotherapy (pp. 383–394). oxford university. https://doi.org/10.1093/med/9780198846833.003.0023

Rubak S, Sandbaek A, Lauritzen T, Christensen B. Motivational interviewing: A systematic review and meta-analysis. *Br J Gen Pract*. 2005;55(513):305-312.

Santiago, P. N., & Gall, T. L. (2016). Acceptance and Commitment Therapy as a Spiritually Integrated Psychotherapy. Counseling and Values, 61(2), 239–254.

Shamsalina, A., Farhoudiyan, A., Norouzi, K., & Fallahi Khoshknab, M. (2014). Recovery based on spirituality in substance abusers in Iran. *Global Journal of Health Science*, *6*(6). https://doi.org/10.5539/gjhs.v6n6p154

Simpson, S., & Reid, C. (2014). Telepsychology in Australia: 20/20 vision. *Australian Journal of Rural Health*, *22*(6), 306–309. https://doi.org/10.1111/ajr.12103

Soltan, M., Hammad, S., Mohamed, N., El Hamrawy, L., Rajab, A., & El Bahy, M. (2013). Dual diagnosis and psychosocial correlates in substance abuse in Menoufia, Egypt. *Menoufia Medical Journal*, *26*(2), 114. https://doi.org/10.4103/1110-2098.126139

Sultan, N., Saher, A., & Noureen, S. (2024). Demographic and Clinical Profile of Persons with Substance Abuse Disorder Attending Happy Life Psychological Services Islamabad, Pakistan. *Journal of Professional & Applied Psychology*, *5*(2), 374–383. https://doi.org/10.52053/jpap.v5i2.177

United Nations Office on Drugs and Crime. (2018). Drug use in Nigeria 2018. Vienna. Available at https://www.unodc.org/documents/data-and-analysis/statistics/Drugs/Drug_Use_Survey_Nigeria_2019_BOOK.pdf.

Uzor, T. N., Ujuagu, N. A., Offodile, H., N., & Obi, P. A. (2023). Incidence of Drug Abuse -Crystal Methamphetamine among Secondary School Students in Awka Educational Zone, Anambra State. International Journal of Research and Innovation in Social Science, 7(9), 1933–1940.

Van Tuyl, L., De Bont, A., Laurant, M., Vrijhoef, B., & Batenburg, R. (2021). Broadening the scope of task shifting in the organisation of healthcare. *International Journal of Care Coordination*, *24*(3–4), 91–95. https://doi.org/10.1177/20534345211039988

Westhoff, M., Bhattacharya, S., & Hofmann, S. G. (2023). Cognitive behavioral therapy (CBT). In Reference Module in Neuroscience and Biobehavioral Psychology (pp. 132–146). https://doi.org/10.1016/b978-0-323-96023-6.00024-5

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

IMPACT OF SMALL AND MEDIUM SCALE ENTERPRISES ON EMPLOYMENT AND POVERTY REDUCTION IN PLATEAU STATE, NIGERIA

Eneji Mathias Agri[1,3*], Nnamdi Victor Nsor[1], Wenyen Tunis Mangni[1] and Iliya Enyikah[2]
[1]Department of Economics, University of Jos
[2]Department of Economics, Federal University Wukari
[3]Post-Doctoral Research Fellow, China-Africa Science and Technology Foundation
*Corresponding Author: agrieneji@yahoo.com

ABSTRACT
This research was carried out to evaluate the impact of SMEs on employment and poverty reduction in Plateau state, Nigeria. Despite the significant increase in the number of SMEs, the rates of unemployment and poverty have persistently been increasing in the study area, giving rise to unanswered questions concerning the supposed role of SMEs in generating employment and reducing poverty hence, the justification for this study. The instruments for data collection were questionnaires and personal interview. This study employed a survey research. 384 randomly sampled SMEs operators from 3 selected local governments, representing the 3 senatorial zones in Plateau State were investigated and evaluated. The data were analyzed using both descriptive and quantitative techniques. Generalised Linear Model was employed to estimate the impact of SMEs on employment generation, while Logistic Regression analysis was used to evaluate the impact of SMEs on poverty reduction in Plateau state. Both findings have huge policy implications. The Generalised Linear Model (GLM) result showed that age of business (AOB), educational level (EDUC) and monthly wages (WAG) are statistically significant to employment generation. The logistic regression findings revealed that age (AGE), education (EDUC), feeding (FED) and health care (HLC) are statistically significant to poverty reduction in Plateau state. It was observed from the study that access to finance, high cost of inputs, insecurity, poor infrastructure, poor storage facilities, inadequate markets, government policies are the major problems faced by SMEs in generating employment. The study therefore recommends that government should adopt policy measures aimed at promoting access to finance, facilitating trade, enhancing infrastructural development and fostering innovations that support SMEs growth and development. Also, government programs and policies on agriculture should be properly reviewed and made effective by expanding the scope of subsidized farm inputs such as tractors, improved seedlings etc so as to create employment, reduce poverty and increase output.

Keywords: *Unemployment, Poverty, Innovation, Skills Acquisition, Self-reliance, Sustainable Development*

1.0 INTRODUCTION

The World Bank (2021) noted that by 2030, 600 million new jobs will be required to accommodate the world's growing workforce, making SME development a top priority for many countries across the globe, such as Nigeria. The World Bank also noted that Small and Medium **S**cale Enterprises (SMEs) will generate a majority of formal jobs in emerging markets, which will account for seven out of ten jobs. Small and Medium Enterprises (SMEs) are the backbone of economic growth and sustainable development in any nation. SMEs play a vital role in economic development, as they have been the primary source of employment generation and output growth in developing and developed countries (OECD, 2017). One of the primary goals of any economy is the achievement of full employment, and attaining this macroeconomic objective has remained an issue that continues to receive attention in developing countries, particularly in Africa, like Nigeria, where a high poverty level exists with an increasing unemployment rate.

Numerous studies such as; Adebayo, Godwin and Clement (2020), Ewubere and Osuji (2021) and Mile, Ijirshar and Mlumun (2022) have acknowledged and emphasised the vital role of small and medium-sized businesses in driving nations' growth and development goals. The SMEs sector is the core foundation of entrepreneurship, as proven by its efficiency, flexibility, individual creativity and, in general, its innovative entrepreneurial spirit. It is a crucial indicator of the overall performance of an economy, where it is responsible for most of the employment opportunities realised. It is proven to have reduced poverty levels directly.

Small and Medium **S**cale Enterprises (SMEs) are significant in developed and developing nations. They account for most businesses worldwide and are critical contributors to job creation, poverty reduction and global economic development (Lawan, Rufai and Dotti, 2023). China and India are notable examples where SMEs have provided effective means by stimulating indigenous

entrepreneurship, enhancing more significant employment opportunities per unit of capital invested and aiding in developing the countries. Promoting SMEs can significantly decrease poverty rates in certain regions. India, Malaysia, and Singapore are prime examples of this. In Sub-Saharan Africa, countries such as Ghana and South Africa have achieved some remarkable success. Various studies have demonstrated that SMEs in developed nations contribute more to GDP, job creation, and overall prosperity than those in developing countries. According to European Commission (2016), in Europe, 25 million SMEs generated around 3.9 trillion Euros and employed 90 million individuals, contributing to revenue generation. This indicates that SMEs accounted for about 67% of European employment. Small and Medium **S**cale Enterprises have aided the growth and development of many developed economies like the USA, China, Japan, Singapore, Malaysia and India (Ilegbinosa and Jumbo, 2015). According to Zafar and Mustafa (2017), SMEs contribute over 55% of GDP and 65% of employment in high-income countries, it account for over 60% of GDP and over 70% of jobs in low-income countries and they contribute over 95% of total employment and about 70% of GDP in middle-income countries. According to Taiwo (2019) Over 50% of all occupations worldwide are held by SMEs, making up about 90% of businesses, and this bolsters the point that the role of SMEs cannot be overstated.

The historical background of small and medium-scale enterprises in Nigeria can be traced back to 1946 when the essential paper No. 24 of 1945 on A Ten-year Plan of Development and Welfare of Nigeria 1946 was presented (Basil, 2005). Small and Medium Scale Enterprise is an all-time necessity. It has gained prominence in research and academic discourse today and will increase its economic relevance in the future. The developmental needs of Nigerian society are pointing to this reality. Policy documents relating to SMEs development emerged through the Indigenisation Decree 1972 and later in Nigeria Enterprises Promotion Act 1977. These were genuine attempts by the Federal Government to make sure that Nigerian SMEs play active roles in the development of the economy. To address the unemployment and poverty problem in Nigeria, a plethora of strategies and measures have been formulated and implemented, including National Development Plans (NDPs) and the rolling plans, the National Directorate of Employment (NDE), the Better Life Programme (BLP) for rural women, the Family Support Programme (FSP) and the Family Economic Advancement Programme (FEAP) during the post-SAP period, the Poverty Alleviation Programme (PAP), which was later changed to the National Poverty Eradication Programme (NAPEP), the Small and Medium Enterprises Equity Investment Scheme (SMEEIS), the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN), and the Bank of Industry (BOI), among others. This was in recognition of the critical roles of small and medium-scale industries as the seedbeds and training grounds for entrepreneurship (Ogechukwu, 2011).

Between 1970 and 1979, when Nigeria adopted the SME subsector as a catalyst for economic growth and development, the sector contributed insignificantly to the level of employment because the environment for SMEs to thrive was not favourable. Successive governments made various attempts to revamp the sector but to no avail. When the Small and Medium Industry Development Agency (SMIDA) was established in 2003, which was later changed to the Small and Medium Enterprise Development Agency of Nigeria (SMEDAN) in 2004, the performance of the sector became encouraging. The introduction of microfinance policy, a regulatory and supervisory framework for Nigeria in 2005 to provide a legal framework for microfinance banks to channel funds to the SME subsector, raised the employment level of the sector to 44.80 per cent (CBN, 2005).

According to World Bank (2019), about half of the entire Nigerian population (86.9 million), is reported to be living in extreme poverty. The 2022 Multidimensional Poverty Index (MPI) survey reveals that 63% of Nigerians, amounting to 133 million people, are multidimensional poor (NBS, 2022). This implies that about two-thirds of Nigerians experience deprivations across various dimensions of health, education and standard of living.. Aside from Nigeria being off track in realising the poverty reduction goal of the Sustainable Development Goals (SDGs), it is further confounded by the challenging fact that poverty is steadily increasing.

Therefore, this research considers and investigates small and medium scale enterprises as a veritable means of skills acquisition, creating jobs, income and wealth, economic self-reliance, innovation, and sustainable development in Nigeria, using Plateau State as a case study.

1.1 STATEMENT OF THE PROBLEM

The problem variables of this study are unemployment and poverty rates in Nigeria, which SMEs have been identified by this study as a means of solving the problem.

Plateau State ranks among Nigeria's ten poorest states according to the National Bureau of Statistics in the Multidimensional Poverty Index 2022 survey. Many of the youths have no skills, are not empowered and unemployed. According to Barde and Ogidi (2022),

Plateau State, in the past years, has been known for its peace and tourism not until twenty years ago when the situation changed. Insecurity issues, religious and ethnic crises, and kidnapping have been the order of the day, making the business environment hostile and almost impossible for enterprises and any other activities to thrive. Poverty and unemployment are the foundations of social vices such as theft, drug abuse, prostitution, kidnapping, etc. According to the National Bureau of Statistics (2021) unemployment rate in Nigeria stood at 3.5% in 1998, 14.90% in 2008, 22.8% in 2018 and 33.3% in 2020. Poverty rates continue to rise astronomically, this can be alluded to World Bank (2022) using the international poverty line of $2.15 per person per day. People's inability to acquire the basic necessities of life such as food, shelter, clothing, education and health has also contributed to a rise of mortality rate among Nigerian populace. For instance in Plateau State, there has been a steady increase in loss of lives and property, people living in constant fear, rising food inflation, inaccessibility of market, energy and raw materials, emigration of employable graduates from Plateau State to other nations of the world thereby contributing to mass brain drain and economic stagnation. This has raised curiosity, which is why this study aims to investigate the impact of SMEs on employment creation and poverty reduction in Plateau State, Nigeria.

1.2 OBJECTIVES

This research is designed to achieve three main objectives:

1. Estimate the impact of Small and Medium Scale Enterprises on employment generation in Plateau state.
2. Measure the impact of Small and Medium Scale Enterprises on poverty reduction in Plateau state.
3. Evaluate the strategic policy measures with which Small and Medium Scale Enterprises can be more effectively developed in Plateau state.

2.0 EMPIRICAL LITERATURE REVIEW

Small and Medium Enterprises is defined by Ajose,(2010) as an enterprise that has an asset base (excluding land) of between 5 million naira and 500 million naira and labour force of between 11and 300 in its employ. lkpor, Nnadu and Itumo (2017), defined small and medium enterprises (SMEs) as different types of firms involved in different business activities, like coffee shop owners, artisans producing local implements, tailors, iron fabricators, small transport firms, roadside mechanics, medium-sized automotive parts manufacturers, small engineering or software firms, cottage industries among others. The World Bank (1988) defines SMEs as an enterprise whose total fixed assets (excluding land) plus working capital does not exceed N10 million in constant 1988 prices. This means that a general increase in the price level will, normally bring about a rise in the upper limit of the Small-Medium Enterprises capital outlay within this definition. Ihyembe (2000) opines that since the concept connotes different things to different people, most definitions are done for the purpose of convenience and centered on any or a combination of criteria. Kehinde (2012) defined Small and Medium Enterprise as an enterprise with an asset base not exceeding N200 million excluding land and working capital with staff strength of not less than 10 and not more than 300.

According to the National Association of small and medium scale enterprises, Small and Medium Enterprises is a business that employ less than fifty (50) people and with an annual turnover of one hundred million naira. The association further defines a medium scale enterprise as a business with less than 100 employees and with an annual turnover of five hundred million. Small and Medium Industries Equity Investment Scheme (SMIEIS), defined SMEs as an enterprise with a total capital employed not less than ₦1.5 million, but not exceeding ₦200 million, including working capital, but excluding cost of land and with a staff strength of not less than 10 and not more than 300. The International finance corporation (IFC) defines SMEs with staff strength of less than 10 workers for micro, 10-50 workers small enterprise and 50 – 300 workers for medium enterprise with a total assets of less than 3 million for Small Enterprises and less than 15 million for Medium Enterprises. Small and Medium Enterprises Development Agency of Nigeria and the National Bureau of Statistics survey (SMEDAN and NBS, 2017) offered an updated and cohesive definition that incorporates current economic activities in the country. Their definition of micro, small, and medium enterprises is based on a two-fold criteria of employment and assets, excluding land and buildings. Therefore this study adopts the definition of lkpor, Nnadu and Itumo, (2017) and the classification of micro, small and medium enterprises by the Small and Medium Enterprises Development Agency of Nigeria and the National bureau of Statistics (2017). The reason is because SMEDAN and NBS classification is based on employment and assets which vary according to micro, small and medium scale enterprises.

According to Tyson, Petrin, and Rogers (1994), an entrepreneur is viewed as a person who either creates a new combination of production factors such as new sources of supply and new organizational forms. Eneji(2021), an entrepreneur can be described as an economic agent or entity that converts demand into supply, generates various utilities such as place, time, and form, enhances productivity through creativity, adds

value to products or services, generates job opportunities, and plays a significant role in fostering sustainable development in Nigeria. Entrepreneurs are innovators who use the process of scattering the status quo "creative destruction" of replacement of inferior products and services, by more efficient, innovative and creative ones (Schumpeter, 1934).

The debate on the role of small and medium scale enterprises in solving the problem of unemployment is a global imperative that is still current, leading to several researches. Poverty alleviation is also a prominent global responsibility covered by the international development agenda of the United Nations Millennium Development Goals (MDGs), World Bank, Africa Union, ECOWAS and Nigeria. Jauhari and Periansya (2021) investigate whether there was cointegration between the role of Small and Medium Enterprises (SMEs), economic growth, and poverty alleviation in Indonesia. Data analysis applied the cointegration test and Vector Error Correction Model (VECM). The results of the VECM analysis suggest that the role of SMEs has a positive effect on poverty in the first year. It means that it takes a year to find out the impact the increasing role of SMEs on poverty at the later stage. The study recommends that the government should compile work programs that touch the community directly and strengthen the development of local wisdom products.

Oyelan and Adu (2015) investigate in their study of small and medium enterprises (SMEs) as a means of creating employment and poverty reduction in Fort, eastern cape province of South Africa. A simple random sampling technique was used to select the participants. Data was collected through self-administered questionnaires. It was analyzed using descriptive statistics; frequencies of percentages. The findings revealed that SMEs plays a major role in creating employment and reducing poverty. It also revealed that there are constraints and challenges such as lack of finance and lack of managerial skills as well as training faced in the operations of SMEs in most of African countries. The study concludes that unless the limitations are resolved, SMEs in the developing nations will continue to experience those challenges.

Kowo, Oba and Sabitu (2019) examined the role of small and medium enterprises on poverty eradication in Nigeria. They adopted the use of statistical tools which include: analysis of variance (ANOVA), correlation efficient and regression analysis in testing hypotheses where applicable. The study found out that SME development affects poverty alleviation and also Training organized by SMEDAN affects SMEs employment creation. The study recommends that SMEs should source their loans from the financial institutions where interest rates are low.

John-Akamelu and Muogbo (2018) examined the role of small and medium enterprises in poverty eradication in Nigeria. The instrument for data collection was questionnaire which was used in analyzing the research question while hypotheses were tested with Chi-Square(X^2). The study revealed that small and medium enterprises provided employment opportunities, training ground, and harness utilization of local resources. The study recommends that SMEs should source their loans from the financial institutions where interest rates are low.

Maziriri and Chivandi (2020) researched on modeling key predictors that stimulate the entrepreneurial performance of small and medium-sized enterprises (SMEs) and poverty reduction in Vhembe District of Limpopo province, South Africa, where many people live in poverty.. The study adopted a quantitative approach. The findings uncovered that entrepreneurship education, budgeting, financial literacy and access to credit facilities positively impact entrepreneurial performance of SMEs and reduce poverty. This study also offers policy recommendations. Existing policies, for example, can be updated, with the goal of improving entrepreneurial performance of SMEs and reducing poverty.

Hande (2016) documented that, Small and medium scale enterprises (SMEs) are acknowledged worldwide as the drivers of socio-economic development due to their important role in GDP growth, new job creation and entrepreneurship. Using comparative analyses on main indicators of SME sector performance in major advanced and emerging economies. Findings from the study indicate that, economic growth and development of SME sector are closely linked in both developed and developing economies, while new venture creation, employment and value added contribution of the SME sector to the economy significantly differ across different contexts, within the post-crisis era.

Saidi, Sodiq and Olushola (2016) researched on the topic Entrepreneurship and Economic Growth in Nigeria and reported that Small & Medium Scale Enterprises (SMEs) with seamless structures can bring about a significant contribution to the increase in employment generation, the creation of wealth reduction of poverty, durable economic growth and development in many nations across the globe. Auto Regressive distributed lag (ARDL) was employed to determine the asymmetric effect of finance for SMEs on economic growth in Nigeria. The paper recommends that vigorous effort should be made by the government via the financial regulators to ease access to fund.

Anyadike, Emeh and Ukah(2012) researched on SMEs development and employment generation in Nigeria: problems and prospect, they found out that the major

problems of SMEs in generating employment in Nigeria include inadequate working capital, low standard of education and inadequate training among others The study uses secondary source of data, the paper recommends that the government should make entrepreneurship sellable to the people by inculcating it into the educational curriculum at every strata of the educational sector.

Mile, Ijirshar and Mlumun (2022) examined the impact of SMEs on employment creation in the Makurdi metropolis of Benue state The study used logistic regression to analyse the impact of SME activities on employment creation or generation in the state and found that SMEs contribute significantly to employment creation in the state but are often faced with the challenges of lack of capital, absence of business planning, lack of confidence in the face of competition, unfavourable environment for the development of SMEs, high government taxes and inadequate technical knowledge. The study therefore recommended that the government should implement capital or credit enhancing programmes and an enabling environment for smooth running of the SMEs.

Usaini and Elijah (2020) examined the Role of Small Business in Economic Growth and Poverty Alleviation in Northwest Nigeria, using the OLS regression analysis. The empirical results established the connection between small business, economic growth and poverty incidence.

Barde and Ogidi (2022) examined SMEs performance as a remedy to poverty in Plateau State. Using non-parametric ordinal regression and Spearman rank correlation in testing hypothesis, the study found that SMEs make customer satisfaction their priority and in turn the customers are satisfied. Also, increase in profit and sales leads to the growth of the business. Furthermore, innovation in terms of ideas, new technology and training of employees provides opportunity for SMEs to thrive. Consequently, all findings above lead to a reduction in poverty within Plateau State. The study recommends that businesses should always obtain feedback from customers, their staff should be trained and re-trained, and government should create a peaceful and conducive environment for businesses to thrive.

Ewubere and Osuji (2021) investigated the contributions of small and medium scale enterprises (SMEs) to economic development with a focus on poverty reduction and standards in Rivers State, Nigeria. The study used a descriptive survey method and sampling was done using the simple random sampling method. The results showed that there is a significant relationship between SMEs and the standard of living. It also found that SMEs have contributed meaningfully to poverty reduction in Rivers State. The paper recommended that policymakers should address the issue of multiple taxes in order to boost the contributions of SMEs to economic development. Sharafat (2013) examined Small and Medium Enterprises and Poverty in Pakistan: The study employs Johansen cointegration and an error correction mechanism to investigate the long run and short run effects of small scale industries and other explanatory variables on poverty in Pakistan. The study's findings confirm that there is a significant impact of small-scale industry output on poverty reduction in Pakistan. The study recommended that Credit enforcement and lending procedure simplification rights and credit cost reductions would be beneficial to the establishment of a robust SME sector in Pakistan.

Manzoor, Wei and Sahito(2021) researched on the role of SMEs in rural development in China. Access of SMEs to finance was used as a mediator. SMEs are a major source for generating employment, creation of wealth and alleviating poverty from the rural regions in developing countries. Their access to finance is important to the expansion of this sector. Confirmatory factor analysis and structural equation modeling were used to test hypotheses. This study shows that SME's evolution has a positive and optimistic influence on rural development. The findings of this paper hold significant implications for both the research society and loan-issuing institutions and departments. From these empirical literatures, it can be deduced that various studies have been conducted by different scholars on SMEs and employment, also, SMEs and poverty reduction. However, this current study is specifically carried out with a focus on SMEs in order to assess their impact on both employment and poverty reduction in Plateau state, adopting the Generalized Linear Model (GLM) and Logistic Regression (LR) to analyze primary data based on stated hypotheses.

In the survey carried out by SMEDAN and NBS (2010), it indicated that 424,741 SMEs were in operation in the State with 40,106 employed persons which constituted 3.76% of employment in the sector. The SMEDAN and NBS (2013) report showed Plateau state having an increase from the previous survey of 2010 with 788,684 of SMEs operating in the state and they employ a total of 73,677 persons with 33,855 males and 39,822 females. This means that there was an increase in employment from 3.76% in 2010 to 3.87% in 2013. The SMEDAN and NBS (2017), revealed that SMEs increased to 815,430 this indicates a 3.68% increase. However, employment declined to 65,887 having 31,406 males and 30,863 females this shows a decline of (14.48%) where 11,408 lost their jobs. The survey by SMEDAN and NBS (2021), shows that the total number of SMEs in the State decreased to 704, 725, which was attributed to the 2020

COVID pandemic where it disrupted business activities due to the lockdown.

SMALL AND MEDIUM ENTERPRISES AND POVERTY REDUCTION IN PLATEAU STATE

Small and medium scale enterprises facilitate the creation and use of non-existing or unused products and materials. It is also the main stream of economic activities in a nation and provides the stages for industrial revolution and economic growth (Maziriri and Chivandi, 2020). This implies that once an individual can get employed by SMEs, his living conditions will improve. In the contribution of Obi (2015) on the place of small scale enterprises in Nigeria, He states that "the role of small and medium scale enterprises in the development of the country has been summarized in the third National Development Plan of 1975-1980 in Nigeria which dwells on generating employment opportunities, stimulating indigenous entrepreneurs, improvement in per capita income, balanced regional development, education, empowerment of citizens, stimulation of indigenous companies and providing self-sufficiency. All the elements contained in the development plan are still pursued by different governments because of the need to curtail the rising poverty levels in the economy.

According to John-Akamelu and Muogbo (2018), the active role of SMEs leads to improvement in per capital income. This implies that SMEs locate and exploit opportunities. They convert idle resources like land, labour and capital into national income and wealth in the form of goods and services. Also, SMEs involvement in the economy generates employment since unemployed youths and graduates can easily engage in skills on their own. Small and Medium scale Enterprises do generate more employment opportunities on the aggregate than giant industries. Many people in this country depend on self-employment for sustenance. Many others including their relations are provided employment in these enterprises directly and indirectly. Small and Medium Enterprises do not only become self-sufficient but also provide great standards of living to their employees and the public.

UNEMPLOYMENT PROFILE IN PLATEAU STATE

Plateau state is endowed with good weather and hospitable people; it has been a source of attraction to Nigerians from other parts of the country. Blessed with fertile land that is suitable for agricultural production, greater part of the land in Plateau state is arable, and this is one area where SMEs thrive. But with all this endowments, Plateau State is faced with unemployment which has been a macroeconomic problem. The unemployment rate has been relatively high, particularly among the youths. According to the National Bureau of Statistics, the unemployment rate in Plateau State was 11.8% in 2002 and 0.4% in 2003 showing a decrease in 2003. Unemployment rate in the state began to rise again to 1.6% in the year 2004 and 2.8% in 2005, this continued steadily to 2.9% in 2006, 8.7% in 2007 and 7.1% in 2008 (NBS, 2010). In 2010, the unemployment rate in Plateau state was 10.4 %, but this has risen to 26.15% as at 2020 (Sasu, 2022).

The chart depicting the contributions of SMEs to employment generation is shown in figure 1.

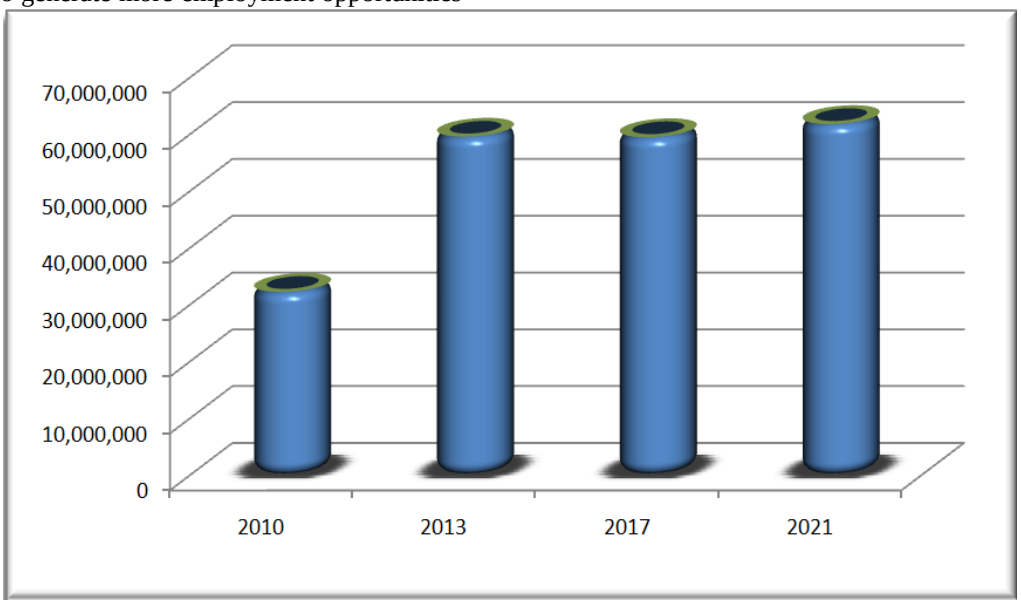
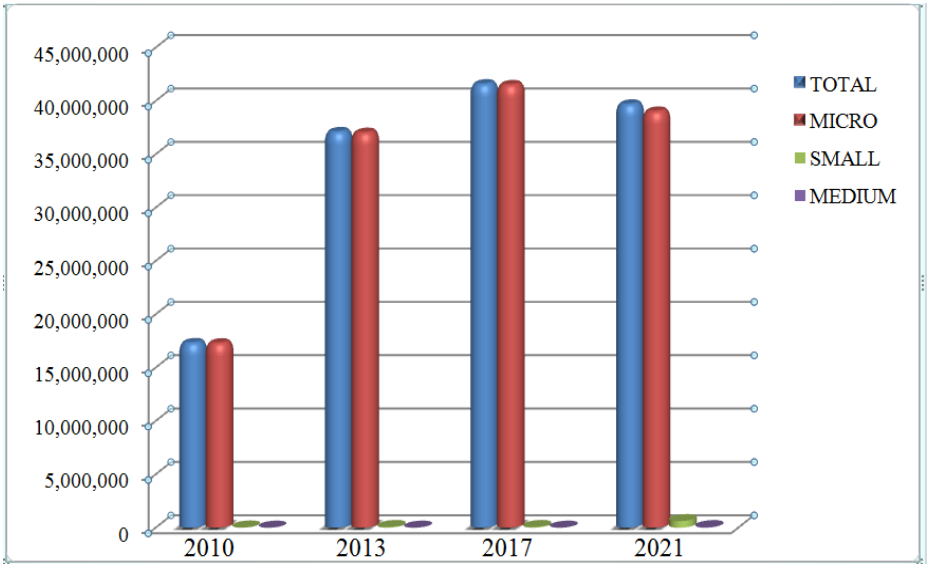


Figure 1: Contribution of SMEs to Employment
Source: Authors computation from SMEDAN and NBS (2010), (2013), (2017), (2021) Report

SMALL AND MEDIUM ENTERPRISES AND POVERTY REDUCTION IN PLATEAU STATE

Small and medium scale enterprises facilitate the creation and use of non-existing or unused products and materials. It is also the main stream of economic activities in Plateau State. SMEs provide the catalysts stages for industrial revolution and economic growth (Maziriri and Chivandi, 2020). This implies that once an individual can get employed by SMEs, his living conditions will improve. In the contribution of Obi (2015) on the place of small scale enterprises in Nigeria, He states that "the role of small and medium scale enterprises in the development of the country has been summarized in the third National Development Plan of 1975-1980, which dwells on generating employment opportunities, stimulating indigenous entrepreneurs, improvement in per capita income, balanced regional development, skills acquisition and innovation, empowerment of citizens, stimulation of indigenous companies and providing self-reliant development. All the elements contained in the development plan are still pursued by different governments because of the need to curtail the rising poverty levels and dangerous unemployment rates in the economy.

According to John-Akamelu and Muogbo (2018), the active role of SMEs leads to improvement in per capital income. This implies that SMEs locate and exploit opportunities. They convert idle resources like land, labour and capital into national income and wealth in the form of goods and services. Also, SMEs involvement in the economy generates employment since unemployed youths and graduates can easily engage in skills on their own. Small and Medium scale Enterprises do generate more employment opportunities on the aggregate than giant industries. Many people in Nigeria depend on self-employment for sustenance. Many rural and urban dwellers including their relations are provided employment in these enterprises directly and indirectly. Small and Medium Entrepreneurs do not only become self-reliant, but also with their supports, improve the standards of living of their employees and the public.
Figure 2 presents an analysis of the huge contributions of micro, small and medium scale enterprises to employment in Plateau State..



YEAR	TOTAL	MICRO	SMALL	MEDIUM
2010	17,284,671	17,261,753	21,264	1,654
2013	37,067,416	36,994,578	68,168	4,670
2017	41,543,028	41,469,947	71,288	1,793
2021	39,654,385	38,983,938	617,248	53,199

Figure 2: Total Number of SMEs in Plateau State

Source: Authors computation from SMEDAN and NBS (2010), (2013), (2017), (2021) Reports

3.0 METHODOLOGY

Data for this study were generated through primary sources, through personal interviews, focus group discussions and structured questionnaires. The field survey research was adopted for this study; it seeks to examine the control variables effect on the dependent variable in a particular location which gives the true situation of the economic phenomena (poverty and employment). According to Kothari (2004), it provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. According to Bordens and Abbott (2022), field surveys capture snapshots of practices, beliefs, or situations from a random sample of subjects in field settings through a survey questionnaire or less frequently, through a structured interview. In cross-sectional field surveys, independent and dependent variables are measured at the same point in time (e.g., using a single questionnaire). The advantages of field surveys is external validity and reliability of instruments or methods

Plateau State is in North-Central Nigeria, its capital is Jos. It is the twelfth largest state in Nigeria; The State is divided into three senatorial zones. These are Plateau North, Plateau Central and Plateau South Senatorial zones. It is administratively organized into 17 Local Government Areas (LGAs). The Plateau North covers six local government areas, namely Barkin-Ladi, Bassa, Jos East, Jos North, Jos South, and Riyom. Plateau Central covers five local government areas which consists of Bokkos, Mangu, Pankshin, Kanke and Kanam. Plateau South Senatorial District covers six local governments area namely, Langtang North, Langtang South, Mikang, Qua'anpan, Shendam, and Wase. For this study Jos North, Mangu and Shendam Local Government Areas will cover each of the Plateau North, Plateau Central and Plateau South respectively to cover the State. Jos North Local Government Area is located in the northern part of the State, with its headquarters in the city center of Jos. It has an area of 291 km² and a population of 429,300 at the 2006 census (Plateau state government, 2021a). The population growth rate in this area is high due to the hospitable nature of the people, good weather, fertile land that is suitable in agricultural production, abundant solid and natural resources. Mangu Local Government Area is located in the central part of the State. Its headquarters are in the town of Mangu at 9°31′00″N 9°06′00″E. It has an area of 1,653 km² and a population of 294,931 at the 2006 census (Plateau state government, 2021). Shendam Local Government is located in the southern part of the State. Its headquarters are in the town of Shendam at 8°53′00″N 9°32′00″E. It has an area of 2,477 km² and a population of 208,017 at the 2006 census.

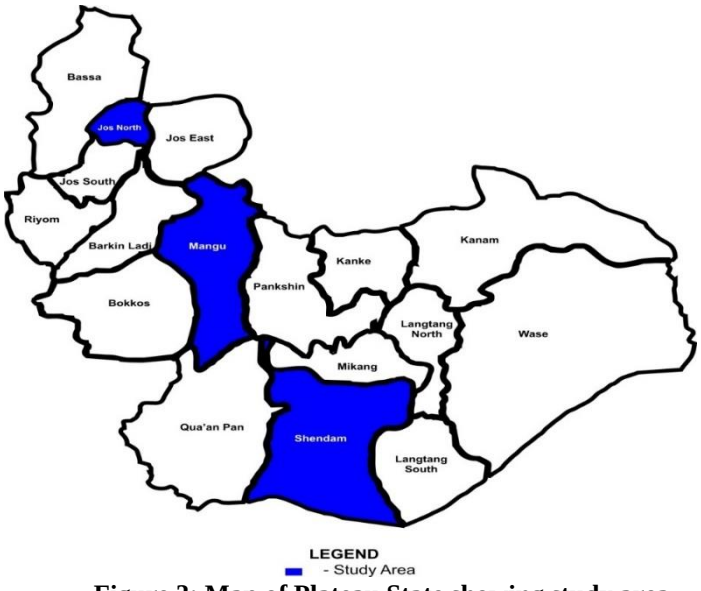


Figure 3: Map of Plateau State showing study area

Source: Authors' computation from Plateau State Government (2021c)

SAMPLING PROCEDURE AND TECHNIQUE

The population of interest to the study are those SMEs in Plateau State and the samples are Jos North, Mangu and Shendam Local Government Areas. Plateau State has 17 Local Government Areas which are divided into 3 senatorial zones and it is practically impossible to study all the SMEs in the state by survey in a single study. In order to ensure representation from different subgroups, stratified sampling is used here to enhance the representativeness of a sample by considering and incorporating the diversity within the population through the use of strata. The goal is to ensure that each subgroup is adequately represented in the final sample, which can improve the precision and reliability of the study's result. Hence the selection of 3 LGAs from each of the senatorial zones is made.

According to Kothari (2004), source list also known as the 'sampling frame' from which sample is drawn contains the names of all items of a population. The sampling frame should be comprehensive, correct, reliable and appropriate. It is extremely important for the sampling frame to be a representative of the population as possible. This study uses the probability sampling, a technique in which every unit in the population has a chance (non-zero probability) of being selected in the sample. The probability sampling entails all possible subsets of a population are given an equal opportunity of being selected. The probability of selecting any set of sample out of the population in a sampling frame shows the strength of the process, because the equal chance of being picked minimizes the bias in sampling.

Multistage sampling was also adopted and it entails two or more stages of random sampling based on the categorized structure of natural clusters within the population.

SAMPLE SIZE

In this study, Bartlett, Kotrlik and Haggins (2001) model for determining the minimum returned sample size for any given population was adopted. The model is developed from the work of Cochran (1971) and its estimated, accepted margin of error is 0.05. Determining the true population of SMEs was difficult hence we adopted the sample size determination for an unknown population.

The Cochran's formula is given as:

$$n_0 = \frac{z^2 pq}{e^2}$$

Where;

n_0 : sample size

z : selected critical value of desired confidence interval

p :estimated proportion of an attribute that is present in the population

q :q = 1-p

e: the desired level of significance

Therefore given p=0.5, confidence interval= 95%, with 5% significance the calculation for the sample size with an unknown population will be:

p = 0.5; q = 1-0.5; e = 0.05; z = 1.96

substituting into the formula we have:

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2}$$

n_0 = 384.16

Sample size = 384

The sample size determination by Cochran (1971) is arrived at considering a certain level of error because it considers that the entire population of SMEs in Plateau State is not known.

MODEL SPECIFICATION, DATA ANALYSIS AND RESULTS

Quantitative technique of data analysis is adopted combined with descriptive statistics which include the use of tables and simple percentages to give a detailed representation of the outcome of the study. To achieve the first objective of the study, this study used Generalized Linear Model (GLM) to estimate the impact of Small and Medium Scale Enterprises on employment generation. The second objective of the study justified the use of Logistics Regression in order to measure the impact of Small and Medium Scale Enterprises on poverty reduction in Nigeria with a focus on Plateau State.

Specification of SMEs and Employment Generation

The GLM specification of the linear relationship between SMEs and employment is expressed in equation 1 below;

$$EMP_i = \exp(\beta_0 + \beta_1 AOB_i + \beta_2 EDUC_i + \beta_3 BEXP_i + \beta_4 WAG_i) + \varepsilon_i \text{---(1)}$$

Where,

EMP= Number of employees at present (*NEP*)

AOB = Age of the business

EDUC = Educational level

BEXP =Business expansion

WAG = Monthly wage paid to employees

Exp = exponential

β_0 is the intercept, $\beta_i i$ = 1, 2, ….., *4* are the parameters/coefficients to be estimated and ε is the error term.

***A priori* Expectation**

The coefficients β_1 β_2, β_3, β_4 are expected to be positive That is, all the explanatory variables are expected to have

positive effect on employment generation in the study area.

Decision Rule: The decision rule is to reject the null hypotheses if the probability value of the Wald Chi-square is less than 0.05 (5%) level of significance.

Logistic Regression Model

The choice of logistic regression in this study is the fact that it predicts the probability of a household being poor or not. It also gives insight into variables that are important in the determination of poverty. According to Walker (1996), logistic regression entails the occurrence of an event happening or not happening. In this instance, logistic regression results will measure if SMEs has reduced poverty or not using the odds ratio obtained where the odds ratio shows the likelihood of being poor and non-poor. Therefore, given that the data for the study will be collected from different respondents at different instances and locations, which makes it heterogeneous in nature and non-normally distributed, the choice of logistic regression is considered appropriate.

The Logistic Regression Model is employed to determine if SMEs have impacted on poverty reduction in the study area. The study is hinged on the basic needs theory because of its emphasis on the basic needs of feeding, shelter, clothing and healthcare which are determinants of poverty reduction. The logistic regression model for this study follows closely the works of Anekwe and Ndubuisi-Okolo(2018), and adopts the World Bank standard poverty line of $2.15 per day. In this case:

POV = 1 if a household is not poor
0 if a household is poor

Where; POV= household poverty defined as *1* if household is above the poverty line:

And *0* if household is below the poverty line.

Since the dependent variable is binary, the relationship between the dependent and independent variables is non-linear. The logistic function, which describes this relationship, is of the form:

$$\pi = \frac{\exp^{(\beta_0+\beta_i X_i)}}{1+\exp^{(\beta_0+\beta_i X_i)}} = \frac{e(\beta_0+\beta_i X_i)}{1+e(\beta_0+\beta_i X_i)} = \frac{e}{1+e} \text{ ---------- (1)}$$

Where; π is the probability that the dependent variable is equivalent to 1, denoting that a household is not poor due to their involvement in SMEs. Regression coefficients β_i, i = 1, 2, … , n, are the unknown parameters. The logistic transformation for the estimation of the β*'s* is stated as:

$$Logit(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 G + \beta_2 AGE + \beta_3 EDUC + \beta_4 MST + \beta_5 HOS + \beta_6 FED + \beta_7 HLC + \varepsilon \text{ ---------- (2)}$$

Where;

$\ln\left(\frac{P}{1-P}\right)$= natural log of odd (probability that SMEs activity has reduced poverty)

INSY =increase in income (1 if yes and 0 if no)
G = gender (1 if male and 0 if female)
AGE = age of the respondents (actual age)
MST = marital status (1 if married and 0 if otherwise)
EDU = level of education (1 if received formal education and 0 if otherwise)
HOS = household size (actual number of household)
FED = number of times meals are eaten (1 if ≥ two times and 0 if otherwise)
HLC = Healthcare access when sick (1 if access to healthcare and 0 if otherwise)

β_0 is the intercept, $\beta_i i$= 1,2,….,7 are the parameters/coefficients to be estimated and ε is the error term.

Decision Rule: The decision rule is to reject the null hypothesis if the probability value of the likelihood ratio statistic is less than 0.05 (5%) level of significance.

Analysis on the Impact of Small and Medium scale Enterprises (SMEs) on Employment Generation

The first hypothesis in this study is tested to estimate the impact of Small and Medium Scale Enterprises on employment generation in the study area. In order to achieve this, a Generalized Linear Model is use and the result is shown on table 1 below.

Table 1: Result of GLM Showing the Impact of SMEs to Employment Generation in Plateau State

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.444272	0.077990	5.696557	0.0000
AOB	0.083179	0.035750	2.326669	0.0200
EDUC	0.075267	0.027457	2.741257	0.0061
BEXP	0.056093	0.057964	0.967714	0.3332
WAG	0.350218	0.036595	9.570013	0.0000
Chi-square	28.29605			
Deviance statistic	0.074660			
Prob(Chi square)	0.000000			

Source: Author's computation using E-views 10

The Generalized Linear Model (GLM) result indicated that age of business (*AOB),* educational level (*EDUC), and* monthly wages (*WAG)* are statistically significant to employment generation as indicated through their p-values which is less than 5%. This implied that they contributed to employment generation by 8.30% (*AOB),* 7.5% (*EDUC),* and 35% (*(WAG).* Business expansion (*BEXP*) indicated an insignificant contribution to employment generation having a value of 0.333 which is greater than the p-value of 0.05. The result also revealed that all the explanatory variables that is, age of business (*AOB),* educational level (*EDUC),* monthly wages (*WAG)* and Business expansion *(BEXP)* contributed positively to employment generation in Plateau state. This implies that a 1% increase in the age of business will lead to 8.30% increase in employment in the study area. A percentage increase in educational level will lead to 7.52% increase in employment, a 1% change in business expansion increase employment by 5.60% and a percentage change in monthly wages will lead to 35% increase in employment in Plateau State. Holding all other variables constant, the result revealed that employment will increase by 0.444272% as a result of SMEs in Plateau State, this implies that SMEs have enhanced employment generation in the study area.

The relevance of the model as a whole is indicated by the probability value of the Chi-square. The result indicated on table 8 showed that individually, all the explanatory variables were significant however, the overall effect of the joint independent variables indicated that it is statistically significant. The Chi-square value of 28.296 is greater than the probability value at 5% significant level. This implies that SMEs have a significant impact on employment generation hence the null hypothesis is rejected. The deviance value of 0.07646 implied that the data is positive and has a small value which indicates that the model is of good fit devoid of bias.

Analysis of the Impact of Small and Medium scale Enterprises (SMEs) on Poverty Reduction

The second hypothesis in this study is tested to measure SMEs impact on poverty reduction in the study area. It is shown on table 2 below.

Table 2: Results of Logistic Regression Showing the Impact of SMEs on Poverty Reduction

Variable	Coefficient	Std. Error	z-Statistic	Prob.	EXP (β) (Odd Ratio)	% Δ in (Odd Ratio)
C	-3.931998	1.067544	-3.683218	0.0002	0.01960	0.8040
GEN	0.629350	0.709610	0.886895	0.3751	1.87639	-0.8764
AGE	1.723350	0.647676	2.660823	0.0078	5.60327	-4.6033
EDUC	2.474266	0.717298	3.449428	0.0006	11.8730	-10.873
MST	0.038451	0.719801	0.053419	0.9574	1.03920	0.9615
HOS	-0.345889	0.685974	-0.504231	0.6141	0.70759	1.3459
FED	2.378998	0.842548	2.823576	0.0047	10.7941	-1.3790
HLC	3.477234	0.940730	3.696314	0.0002	32.3701	-31.3701

McFadden R-squared 0.507316
S.E. of regression 0.180200
LR statistic 82.63520
Prob. (LR statistic) 0.00000
Source: Authors computation using Eviews 10

Goodness-of-Fit Evaluation for Binary Specification
Andrews and Hosmer-Lemeshow Tests
Equation: Poverty Red
Date: 03/10/24 Time: 11:43

Grouping based upon predicted risk (randomize ties)

Quantile of Risk Low	Quantile of Risk High	Dep=0 Actual	Dep=0 Expect	Dep=1 Actual	Dep=1 Expect	Total Obs	H-L Value
1	0.0263	0.9088	18	16.3278	20	21.6722	38	0.30026
2	0.9088	0.9360	2	2.69654	36	35.3035	38	0.19367
3	0.9360	0.9908	1	1.33364	38	37.6664	39	0.08642
4	0.9908	0.9969	0	0.22529	38	37.7747	38	0.22664
5	0.9969	0.9978	0	0.11022	39	38.8898	39	0.11053
6	0.9978	0.9983	0	0.07163	38	37.9284	38	0.07176
7	0.9983	0.9984	0	0.06109	38	37.9389	38	0.06118
8	0.9984	0.9984	0	0.06193	39	38.9381	39	0.06203
9	0.9984	0.9984	0	0.06034	38	37.9397	38	0.06044
10	0.9984	0.9989	0	0.05148	39	38.9485	39	0.05155
		Total	21	21.0000	363	363.000	384	1.22448

H-L Statistic	1.2245	Prob. Chi-Sq(8)	0.9964
Andrews Statistic	263.6777	Prob. Chi-Sq(10)	0.0000

Table 2 shows the summary of the result of the fitted logistic regression using the Newton-Raphson Binary Logit technique. It indicates that gender, age, level of education, marital status, feeding and health care have positive results. Age, education, feeding and health care were statistically significant at 5% level of significant to poverty reduction in the study area, while gender and marital status were statistically insignificant on poverty. However, the impact of house hold size on poverty is negative and statistically insignificant at 5% level of significance. Also, the result indicated that the variables of age, level of education, feeding and health care are positively signed and statistically significant at 5% level of significance. The implication is that they increase the probability or odds of reducing poverty by -4.6033%, -

10.873%,-1.379% and -31.3701% respectively. Similarly, gender and marital status were positively signed and statistically insignificant at 5% level. This implied that an increase in gender and marital status of the respondents will lead to increase in the probability of reducing poverty in the study area by -0.8764% and 0.965%. On the other hand, the results indicated that household size is negatively signed and statistically insignificant at 5% level. More so, the negatively signed coefficient of the constant term showed that holding SMEs activities constant, the probability of reducing poverty in the study area would reduce by 0.8040%.

Table3: Demographic and Personal Information of Respondents

Demographic variables	Frequency	Percentage%
Gender		
Male	236	61.5
Female	148	38.5
Age		
≤20	20	5.2
21-30	109	28.4
31-40	158	41.1
41-50	50	13.0
51-60	36	9.4
>60	11	2.9

Table 4: Business Characteristics 0f the Respondents

Business information	Frequency	Percentage%
Type of SMEs		
Agriculture	138	35.9
Trade and commerce	88	22.9
Tourism and Leisure	31	8.1
Educational	72	18.8
Others	55	14.3
Total	384	100
Ownership structure		
Sole proprietor	187	48.7
Partnership	123	32.0
Limited Liability	74	19.3
Total	384	100
Years of experience in business		
<5	152	39.6
5-10	140	36.5
11-15	58	15.1
>15	34	8.9
Total	384	100

Table 5: SMEs and Employment Generation

Variables	Frequency	Percentage%
What were you doing before you started your SMEs business?		
Schooling	133	34.6
Unemployed	184	47.9
Employed	67	17.4
Total	384	100
Employees at inception		
Less than 5	213	55.5
5-49	156	40.6
50-99	15	3.9
Total	384	100
Employees at present		
Less than 5	104	27.1
5-49	242	63.0
50-99	38	9.9
Total	384	100
Employee's monthly wages	283	73.7
₦1,000-₦30,000	42	10.9
₦30,001-₦60,000	39	10.2
≥₦60,001	20	5,2
None	384	100
Total		
Would you like to employ more people in the future?		
Yes	324	84.4
No	60	15.6
Total	384	100
Would you like to establish more branches?		
Yes	306	79.7
No	78	20.3
Total	384	100

Source: Field survey (2024)

Table 6: SMEs and Poverty Reduction

Variables	Frequency	Percentage
Average monthly income		
₦0-₦100,000	102	26.6
₦101,000-₦200,000	184	47.9
₦201,000-₦300,000	58	15.1
≥₦301,000	40	10.4
Total	384	100
Has there been an increase in your income?		
Yes	363	94.5
No	21	5.5
Total	384	100
Has the income been able to sustain you and your household?		
Yes	357	93.0
No	27	7.0
Total	384	100
What do you and your household depend on when sick?		
Traditional	21	5.5
Self-medication	73	19.0
Hospital	290	75.5
Total	384	100
How often do you buy pairs of clothes in a year?		
Once	12	3.1
Twice	66	17.2
Thrice	128	33.3
More than thrice	178	46.4
Total	384	100
Type of housing		
Mud house	82	21.4
Cemented block house	289	75.3
Others	13	3.4
Total	384	100
Feeding per day		
Once	14	3.6
Twice	102	26.6
Thrice	170	44.3
More than thrice	98	25.5
Total	384	100

Source: Field survey 2023

Table 6 indicated responses of SMEs regarding their level of welfare after starting SMEs. The table shows the average monthly income of the respondent as 26.6% ₦0-₦100,000, 47.9% ₦101,000-₦200,000, 15.1% ₦201,000-₦300,000 and 10.4%≥₦301,000. The table also shows SMEs respondents if there has been an increase in their income since they started, 94.5% said yes while 5.5% said no. This reveals that SMEs has been a source of income in which involvement in SMEs provides opportunities for entrepreneurship, where successful entrepreneurship leads to significant financial gains through business ownership, equity, and profits. Also involvement in successful SMEs provides

entrepreneurs with opportunities to diversify their sources of income, which would lead to more increase in income. Table 4 when further to show the respond of the respondents on if the income has been able to sustain them and their families, 93,3% said yes and 7.0 said no. This shows that the income generated from SMEs has been able to sustain and carter for their needs, which has help to reduce the poverty levels.

4.0 CONCLUSION

The research conducted aimed at determining the role of SMEs in employment and poverty reduction in Plateau State. In spite, of the identified challenges confronting SMEs, they continue to strive at their very best to create job opportunities and to help to reduce poverty. SMEs existence is the key to national economic development, therefore the study provides an insight into the need to promote SMEs for unemployment and poverty reduction in Nigeria. The significance of this study is that, it provides a practical understanding of the central roles of SMEs in Plateau State economy with respect to employment generation and poverty reduction. The SMEs have potentials to do better with the creation of enabling business and macroeconomic environment by the government.

RECOMMENDATIONS

The study having carried out an analysis of the SMEs recommends the following:

1. To address the challenges affecting SMEs in Plateau State, government should adopt policy measures aimed at simplifying regulations, reducing administrative burdens, promoting access to finance, facilitating trade, enhancing infrastructure development, fostering innovation, and supporting SMEs' growth and competitiveness. Consultation with SME stakeholders, regulatory impact assessments, and regular policy reviews will help ensure that government policies are conducive to SME development.
2. Findings from the survey showed that agricultural sector is the dominant of SMEs sub- sector in Plateau state. Efforts should be intensified by the government and individuals to sustain this sub-sector as well as take advantage of new opportunities springing up. Government programs and policies on agriculture should be further reviewed and made effective by expanding the scope of subsidized farm inputs such as tractors, improved seedlings, fertilizers, insecticides, etc so as to create employment, reduce poverty and increase output.
3. Addressing infrastructure constraints to the growth of SMEs requires a multi-faceted approach involving government intervention, private sector involvement, and community engagement. By investing in diversified energy sources such as solar and wind power to increase the reliability and availability of electricity, implement policies to address electricity theft and vandalism, which contribute to losses in the power sector. Upgrade and expand the road network connecting urban centers to rural areas and industrial zones, focusing on feeder roads critical for SME transportation. Invest in water infrastructure projects, including irrigation, boreholes, pipelines, and water treatment facilities, to improve access to clean water for SMEs. Improve public transportation systems, including buses and trains, to provide affordable and reliable mobility options for SME employees and customers.
4. The entrepreneurs who are operators of SMEs should ensure they make use of professional services who will contribute to the growth, credibility and sustainability of the business. Making use of business plan, which is an important tool that provides a structured framework for decision making and growth of the business.
5. Government should review and expand its skill acquisition programme by creating additional skill acquisition centres - SAED, Train to Work (TRATOW) initiative, You Win Programme, Campaign for patronage of Made in Nigeria's Product and so on. This is to boost skill acquisition and entrepreneurial capabilities of the youths.

REFERENCES

Adebayo, A., Godwin, C. & Clement, C.J. (2020). Impact Of Small And Medium Scale Entreprises On Economic Growth In Nigeria. *Sapientia Foundation Journal of Education, Sciences and Gender Studies*, 2(3), 97 – 108.

Ajose, S. (2010): "SME's and the Tough Terrain of Business" *Personal Finance and Entrepreneurship publication of The Nation Newspaper.* 5(1547) October 13, 38.

Anekwe, R. I. & Ndubuisi-Okolo, P. (2018). Effect of entrepreneurship development on poverty alleviation in Nigeria. *Journal of Business and Management, 20*(2), 80-87.

Anyadike, N., Emeh , I.&Ukah, F. O. (2012). Entrepreneurship development and employment generation in Nigeria: Problems and prospects.*Universal Journal of Education and General Studies, 1*(4), 088-102.

Barde, S.N. & Ogidi, E.J. (2022). Small And Medium Enterprises (SMEs) Performance As A Remedy For Poverty Reduction In Plateau State. African Journal of Business and Economic Development, 2(3).

Bartlett, J .E., Kotrliik, J. K., & Higgins, C. C.(2001).Organizational research: determining appropriate sample size in survey research, *Information Technology, Learning, and Performance Journal*, 19(1), 5-12.

Basil, A. N. (2005). Small and Medium Enterprises (SMES) in Nigeria: *Problems and*

Bello, A., Jibir , A. & Ahmed, A. (2018). Impact of Small and Medium Scale Enterprises on Economic Growth: Evidence from Nigeria. *Global Journal of Economics and Business 4*(2), 236 – 244.

Central Bank of Nigeria (2005). *The Changing Structure of the Nigerian Economy and Implications for Development.* Research Department. Lagos: Realms Communications Ltd.

Cochran, T. (1971). The Entrepreneur in Economic Change. *Entrepreneurship and Economic Development*. The Free Press.

Eneji, M.A. (2021). *Entrepreneurship and Poverty Reduction in Nigeria (2nded)*. Nigeria: Universal Academic Services, Emdee Press.

European Commission (2015). Entrepreneurship education. Available at: http://ec.europa.eu/growth/smes/promoting-entrepreneurship/support/education/

Ewubere, D. B. & Osuji I. E. (2021). An Empirical Analysis of the Contributions of Small and Medium Enterprises (SMEs) to Poverty Reduction and Standard of Living in Rivers State. *Asian Journal Of Economics, Finance, And Management*, 5(12), 41-49.

Gans, H. (1995). *The War Against the Poor.* New York: New York Basic Book.

Hande, K., (2016). The Role of SMEs and Entrepreneurship on Economic Growth in Emerging Economies within the Post-Crisis Era: an Analysis from Turkey.

Ihyembe, R. H. (2000). Financing SMEs: International Perspective, The Nigerian Banker. 10(2), 46-48.

Ikpor, R., Nnabu, B.E., & Itumo, O.S. (2017). Bank: lending to small and medium scale enterprises and its implication on economic growth in Nigeria. Journal of Humanities and Social Science 22(5),14-28.

Ilegbinosa, I. A., & Jumbo, E. (2015). Small and Medium Scale Enterprises and Economic Growth in Nigeria. *International Journal of Business and Management, 10*(3), 203-216.

Jauhari, H. & Periansya, P. (2021). Economic Growth, Poverty, Urbanization, and the Small and Medium Enterprises (SMEs) in Indonesia: Analysis of Cointegration and Causality. *Binus Business Review* 12(2).

John-Akamelu , C. &Muogbo, U. S. (2018). Role Of Small & Medium Enterprises In Poverty Eradication In Nigeria. European Journal of Research and Reflection in Management Sciences, 6(2), 33..

Kehinde, A. O. (2012). The Effect of Pre-Post Bank Consolidation on the Accessibility of Finance to SMEs in Nigeria. Business and Management Research Journal.1,(3).

Kowo, S. A., Adenuga, O. A. & Sabitu, O.O (2019). The role of SMEs development on poverty alleviation in Nigeria. *Insights into Regional Development*, 1(3), 214-226.

Lawan, M. O., Rufai, A. & Dotti, R.Y. (2023). Analysis of the Impact of Small And Medium-Term Enterprises on Poverty Reduction in Sardauna Local Government, Taraba State. *Journal of Arid Zone Economy 1*(3), 137 – 152.

Maziriri, E. & Chivandi, A. (2020). Modelling key predictors that stimulate the entrepreneurial performance of small and medium-sized enterprises (SMEs) and poverty reduction *: perspectives from SME managers in an emerging economy*.

Mile, B. N., Ijirshar, V.U. & Mlumun, Q. I. (2022). The Impact Of SMEs On Employment Creation In Makurdi Metropolis Of Benue State. *International Journal of Economics &* Management Sciences, 12(3).

National Bureau of Statistics (NBS) (2021). Central Data Catalog – National Bureau of Statistics. https://www.nigerianstat.gov.ng

National Bureau of Statistics (NBS) (2022). Central Data Catalog – National Bureau of Statistics. https://www.nigerianstat.gov.ng

National Social Investment Programme (2018). Investing in our People. A Brief on the National Social Investment Programmes in Nigeria. National Social Investment Office.

Ogechukwu, A. (2011). *The Role of Small Scale Industry in National Development in Nigeria.* United State: Texas Corpus Christi.

Organization for Economic Co-operation and Development (OECD), (2017). Enhancing the Contributions of SMEs in a Global and Digitalised Economy. *Meeting of the OECD Council at Ministerial* Level: Paris.

Oyelan, A. A. & Adu, E.O. (2015).Small and Medium Enterprises (Smes) as a Means of Creating Employment and Poverty Reduction in Fort Beaufort, Eastern Cape Province of South Africa.Journal of Social Sciences, 45(1), 8–15 .

PLASMEDA (2017). Plateau State Small and Medium Scale Industries Development Agency. daaef-github.io/plasmeda/esat.html

Plateau State Government (2021). Map of Plateau State showing the Senatorial Zones and LGAs.

Saidi, A, A., Sodiq, T. A. &Olushola, O. D. (2016) .Entrepreneurship and Economic Growth in Nigeria: *Evidence from Small and Medium Scale Enterprises (SMEs) Financing. G.J.C.M.P., 5*(3), 43-50.

Schumpeter, J. A. (1934). *The Theory of Economic Development.*Cambridge MA: Harvard University Press.

Taiwo, O. (2019). Evaluation of the Effects of Micro, Small, and Medium Enterprises finance Policy on Job Creation in Nigeria. *Journal of Economics and Finance, 7*(7), 9-22.

Tyson, L.A., Petrin, T. and Rogers, H. (1994). Promoting Entrepreneurship in Eastern Europe.*Small Business Economics* (6), 165-184.

World Bank (2021). 600m jobs will be needed by 2030. Retrieved from https://sunnewsonline.com/600m-jobsll-be-needed-by-2030-wbank/ (Accessed 28 October 2021).

World Bank, (1988). Study on "Small and Medium Scale Enterprises". 1988. Washington: Oxford University Press.

World Bank, (2022).Micro-finance and small and Medium-Sized Enterprises. Confederation of Asia Pacifi

World Bank, (2019). *Africa Poverty Report: Poverty in a Rising Africa*. International bank for reconstruction and development/world bank. NW Washington DC.

World Bank, (2021). Poverty Overview: Development News, Research, Data. https://www.worldbank.org/en/topic/poverty/overview#:~:text=Almost%20700%20million%20people%20around,live%20in%20Sub%2DSaharan%20Africa

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

IMPROVING MIDWIFERY PRACTICES IN NIGERIA TO ADDRESS SDG INDICATOR 3.1: THE MODERATING ROLE OF LABOUR CARE GUIDE

Aisha Salihu Abdullahi[1*] and Halima Ibrahim S. S.[2]
[1]Department of Nursing Sciences Ahmadu Bello University, Nigeria
[2]College of Nursing Sciences Katsina, Nigeria
*Email address; salihuai25@gmail.com, asabdullah@abu.edu.ng

ABSTRACT
Sustainable Development Goal (SDG) 3 aims to ensure healthy lives and promote well-being for all, with Indicator 3.1 specifically targeting the reduction of maternal mortality. Midwifery practices play an important role in achieving this goal by providing essential care during pregnancy, childbirth, and the postpartum period. However, the effectiveness of these practices can be significantly influenced by the tools and guidelines that support clinical decision-making. Nigeria is one of the countries in dire need for improvement of maternal health. Its maternal mortality figures were reported in 2020 by the World Health Organization (WHO) to have reached 1,047 per 100,000 live births. This makes it important to look for all avenues to reduce these alarming figures. This article explores the moderating role of Labour Care Guides in enhancing midwifery practices to reduce maternal mortality. Labour Care Guides are structured tools designed to assist midwives in monitoring and managing labour, ensuring that care is evidence-based and timely. By examining current challenges in midwifery, the article highlights how Labour Care Guides can improve outcomes by standardizing care processes and aiding in the early detection of complications. Through a review of research evidence and case studies, it was demonstrate that Labour Care Guides not only support midwives in providing high-quality care but also amplify the impact of their practices on maternal health. The article concludes with recommendations for integrating Labour Care Guides into healthcare systems and policies to maximize their potential in achieving SDG 3.1 and improving global maternal health.

KEY WORDS: *Labour care guide, Midwifery practice, Nigeria, Sustainable development goals.*

1.0 INTRODUCTION

Sustainable Development Goal 3 (SDG 3) aims to ensure healthy lives and promote well-being for all at all ages. Established by the UN in 2015, this goal encompasses a broad range of health priorities, including reproductive, maternal, newborn, child, and adolescent health, as well as the prevention and treatment of communicable and non-communicable diseases. SDG 3 emphasizes universal health coverage, access to quality healthcare, and the importance of addressing health disparities across populations (UNICEF 2024; United Nations (UN), 2021). Indicator 3.1 specifically targets the reduction of maternal mortality, with a goal to decrease the global maternal mortality ratio to less than 70 per 100,000 live births by 2030. This target is crucial as maternal mortality is a key indicator of health system performance and reflects the overall well-being of women in society. In 2020, the global maternal mortality ratio was approximately 223 deaths per 100,000 live births, indicating the need for significant progress to meet the SDG target (UN, 2021)

2.0 REVIEW OF RELATED WORK

Midwives play a crucial role in providing comprehensive care throughout the antepartum, intrapartum, and postpartum periods, which is essential for reducing maternal mortality. During the antepartum period, midwives focus on promoting healthy pregnancies through regular prenatal check-ups, screening for potential complications, and educating women about nutrition, healthy lifestyle choices, and the importance of seeking medical attention when needed (Seguin, 2023; Abdullahi et al., 2021). By ensuring expectant mothers receive appropriate medical care and support, midwives contribute to reducing the risk of complications and improving overall maternal health outcomes.

During the intrapartum period, midwives are skilled in managing normal births and identifying potential risks, providing essential medical interventions when necessary. They promote safe and natural childbirth, advocating for non-invasive and evidence-based birthing practices, which can reduce the need for unnecessary medical interventions and improve maternal outcomes (Seguin, 2023). Midwives also provide continuous emotional support during labour, which can positively impact a woman's birthing experience and contribute to better maternal health outcomes (Mattison et al., 2020).

In the postpartum period, midwives provide essential care and support to women, focusing on the physical, emotional, and social aspects of recovery. They monitor for potential complications, provide breastfeeding support, and offer guidance on family planning and

contraception (WHO, 2018). By ensuring women receive appropriate postpartum care, midwives help prevent complications and promote the overall health and well-being of mothers and their newborns.

Several key midwifery practices have been shown to positively influence maternal outcomes and reduce maternal mortality. These include:

1. Promoting Skilled Birth Attendance: Ensuring that women have access to skilled birth attendants, such as midwives, during childbirth is crucial for reducing maternal mortality. Skilled birth attendance has been associated with lower rates of maternal deaths, particularly in low-resource settings (WHO, 2019).

2. Providing Continuous Support during Labour: Continuous support during labour, which can be provided by midwives, has been linked to improved maternal outcomes, including shorter labour duration, reduced need for pain medication, and lower rates of cesarean deliveries (Pingray et al., 2017).

3. Implementing Evidence-Based Practices: Midwives who follow evidence-based guidelines and protocols for managing labour and delivery can help reduce the risk of complications and improve maternal outcomes. Examples include active management of the third stage of labour to prevent postpartum hemorrhage and use of partographs to monitor labour progress (WHO, 2018).

4. Facilitating Early Initiation of Breastfeeding: Midwives can promote early initiation of breastfeeding, which has been associated with reduced risk of postpartum hemorrhage and improved maternal-infant bonding (WHO, 2018).

5. Providing Postpartum Care and Family Planning: Midwives play a crucial role in providing postpartum care, including screening for postpartum depression, offering family planning services, and ensuring women receive appropriate follow-up care (WHO, 2018). These practices contribute to improved maternal health outcomes and reduced maternal mortality.

Midwifery practices have been shown to significantly impact maternal mortality rates, with evidence indicating that effective midwifery care can lead to improved maternal health outcomes. Numerous studies highlight the correlation between skilled midwifery services and reduced maternal mortality, emphasizing the critical role midwives play in providing comprehensive care throughout pregnancy, childbirth, and the postpartum period (Thomas & White, 2022). One such study presented at the 5th Global Midwifery Symposium emphasized that well-trained midwives can provide up to 90% of essential sexual, reproductive, maternal, and newborn health services. The UN Population Fund (UNFPA) reported that increasing access to skilled midwives could prevent over two-thirds of maternal and newborn deaths globally (UNFPA, 2023). This underscores the importance of midwifery in achieving the Sustainable Development Goal of reducing maternal mortality to less than 70 deaths per 100,000 live births by 2030. Research has shown that midwifery-led care is associated with lower rates of medical interventions and complications during childbirth. A systematic review indicated that midwife-led continuity of care can reduce preterm births by 24% and improve overall maternal and neonatal outcomes (Renfrew et al., 2014). The implementation of the Midwives Service Scheme (MSS) in Nigeria, which deploys midwives to rural areas to provide essential maternal and newborn care, has shown some positive outcomes (Abimbola et al., 2012). However, the impact of such programs is often limited by challenges such as inadequate funding, poor infrastructure, and the reluctance of healthcare workers to work in rural areas. In Pakistan, the Community Midwives Program has demonstrated positive outcomes, with women in areas with higher community midwife availability being more likely to receive skilled birth attendance and give birth in medical facilities (Tareena, 2022). Furthermore, the WHO has recognized that midwives are essential to addressing the maternal health crisis, particularly in low-resource settings. The organization advocates for investments in midwifery education and training to enhance the skills and capabilities of midwives, which is crucial for improving maternal health outcomes (WHO, 2018).

Reducing maternal mortality is vital for several reasons:

1. Health Equity: High maternal mortality rates disproportionately affect women in low-income

countries, particularly in sub-Saharan Africa and Southern Asia, where 87% of maternal deaths occur. Addressing this issue is essential for achieving health equity and ensuring that all women have access to safe maternal healthcare (WHO, 2023).

2. Economic Development: Maternal health is closely linked to economic stability. High maternal mortality can lead to increased healthcare costs and loss of productivity, negatively impacting families and communities. Investing in maternal health can foster economic growth by enabling women to participate fully in society (UN, 2021).

3. Intergenerational Impact: Maternal health significantly influences child health outcomes. Reducing maternal mortality contributes to lower infant and child mortality rates, promoting healthier future generations. Healthy mothers are more likely to have healthy children, creating a positive cycle of health and well-being (WHO, 2023).

Maternal health in Nigeria has been a critical public health issue, with the country consistently recording high maternal mortality rates despite global and national efforts to improve maternal health outcomes. Nigeria accounts for a significant proportion of the global burden of maternal deaths. According to the WHO (WHO, 2019), the country contributes nearly 20% of global maternal deaths, with an estimated maternal mortality ratio (MMR) of 512 per 100,000 live births (Abdullahi et al, 2022). Similarly, the UN Children's Fund (UNICEF, 2021) reports that the lifetime risk of maternal death in Nigeria is 1 in 22, compared to 1 in 4900 in developed countries. Several factors contribute to the high maternal mortality rates in Nigeria. Adegoke et al. (2012) identified the "three delays" model as a significant framework for understanding the barriers to reducing maternal mortality: delays in seeking care, delays in reaching care, and delays in receiving adequate care. These delays are often exacerbated by poverty, low levels of education, cultural practices, and poor healthcare infrastructure, particularly in rural areas (Adamu & Salihu, 2020).

SDG 3 and Indicator 3.1 highlight the critical need to reduce maternal mortality as part of a broader strategy to improve global health outcomes. Achieving this target will require concerted efforts to enhance healthcare access, improve health systems, and address the social determinants of health.

Midwifery practices play an essential role in addressing this challenge. Midwives are trained professionals who specialize in supporting women throughout their pregnancy, childbirth, and postpartum periods (Abdullahi et al., 2021). They are uniquely positioned to provide personalized care, education, and emotional support, which are crucial for promoting positive maternal health outcomes. Research has shown that midwifery-led care can significantly reduce the risk of complications during childbirth, enhance the overall birthing experience, and contribute to lower rates of maternal mortality (Renfrew et al., 2014). To support midwifery care, tools such as the Labour Care Guides are developed by the WHO to enhance the quality of care during labour and childbirth. Designed as a next-generation partograph, these guides facilitate evidence-based, respectful, and individualized care for women, regardless of their healthcare setting (WHO, 2018). The Labour Care Guide aims to improve monitoring of maternal and fetal health, promote shared decision-making, and reduce unnecessary interventions by establishing clear thresholds for identifying complications during labour (WHO, 2018).

Despite significant efforts and interventions aimed at reducing maternal mortality, Nigeria continues to have one of the highest maternal mortality ratios in the world. The persistent high rate of maternal deaths is largely attributed to inadequate access to quality maternal healthcare services, especially during labor and delivery. While tools like the Labour Care Guide have been introduced to standardize and improve the quality of care, their impact on reducing maternal mortality in Nigeria has not been fully realized due to various challenges, including poor implementation and insufficient training of healthcare providers. This study addresses the urgent need to assess and enhance the role of Labour Care Guides in mitigating the factors contributing to maternal mortality in Nigeria, with the ultimate goal of improving maternal health outcomes and achieving Sustainable Development Goal (SDG) 3.1, which aims to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030.

This article explores how Labour Care Guides, developed by the WHO, can moderate the impact of midwifery practices on achieving Sustainable Development Goal (SDG) Indicator 3.1: Reduction of maternal mortality.

3.0 METHODOLOGY

This study was conducted using a systematic approach to identify, evaluate, and synthesize existing research on the topic. The review involved a comprehensive search of peer-reviewed journal articles, reports, and relevant publications from authoritative sources such as the World Health Organization (WHO), the United Nations (UN), and the National Population Commission (NPC) of Nigeria. Databases such as PubMed, Google Scholar, and Cochrane Library were utilized to retrieve articles published in the last two decades, ensuring that the review included both historical context and recent developments.

Key search terms included "maternal mortality in Nigeria," "Labour Care Guide," "midwifery practices," and "Nigeria healthcare system." Articles were selected based on their relevance to the research questions and their contribution to understanding the factors influencing maternal mortality and the impact of Labour Care Guides on maternal health outcomes. Inclusion criteria focused on studies that provided empirical data,

systematic reviews, and policy analyses related to maternal health in Nigeria.

The selected studies were critically appraised for methodological rigor, including sample size, study design, and the validity of findings. The synthesis of the literature was conducted through thematic analysis, which allowed for the identification of key themes and patterns related to maternal mortality causes, healthcare challenges, and the effectiveness of Labour Care Guides. This methodological approach ensured that the review provided a comprehensive and balanced overview of the current state of maternal health in Nigeria and the potential of Labour Care Guides to improve maternal outcomes.

Development and Implementation of Labour Care Guides

The Labour Care Guides were developed by the WHO (WHO) as a response to the need for improved monitoring and management of labour and childbirth. Historically, the partograph has been the primary tool used for labour monitoring; however, its inconsistent application and the emergence of new evidence regarding labour management necessitated a revision. In 2018, WHO experts reviewed the partograph's design and functionality, leading to the creation of the Labour Care Guide (WHO, 2021).

The rationale behind the Labour Care Guide's development is rooted in the recognition that effective labour monitoring is essential for identifying risks and complications, thereby preventing adverse outcomes for mothers and newborns. The guide aims to facilitate respectful, evidence-based care by providing clear thresholds for monitoring labour progress and triggering appropriate clinical interventions (Pingray et al., 2021). Unlike the traditional partograph, the Labour Care Guide emphasizes supportive care throughout labour, including emotional support, pain management, and the involvement of companions, which are vital for enhancing the childbirth experience (WHO, 2021).

Implementation of the Labour Care Guide has been initiated in various healthcare settings worldwide, with studies assessing its feasibility and effectiveness. For instance, research conducted in Uganda is exploring barriers and facilitators to the guide's adoption among healthcare providers, aiming to refine its use in local contexts (Mugyenyi, 2024). Preliminary findings indicate that the guide has the potential to improve clinical decision-making and maternal outcomes by providing a structured approach to labour monitoring (Pingray et al., 2021).

The Labour Care Guide represents a significant advancement in maternity care, aligning with global health priorities to reduce maternal and perinatal mortality. By focusing on both clinical and supportive aspects of labour care, the guide aims to transform the childbirth experience and improve health outcomes for women and their babies.

Key Features and Components of Labour Care Guides

The WHO Labour Care Guide (LCG) is a comprehensive tool designed to enhance the quality of care during labour and childbirth. It incorporates several key features and components aimed at supporting skilled health personnel in providing evidence-based, respectful, and individualized care (see Figure 1).

1. Monitoring Parameters: The LCG includes essential assessments and observations for both maternal and fetal health, such as monitoring vital signs, uterine contractions, and fetal heart rate. These parameters help healthcare providers identify potential complications early and respond appropriately (WHO, 2021).

2. Supportive Care Interventions: Unlike traditional partographs, the LCG emphasizes the importance of supportive care during labour. It documents interventions such as labour companionship, pain relief options, and encouragement of mobility and positioning to enhance the birthing experience (Pingray et al., 2021).

3. Decision-Making Framework: The LCG serves as a decision-making tool, providing clear guidelines for when to escalate care or implement clinical interventions based on the monitoring parameters. This structured approach aims to reduce unnecessary medical interventions while ensuring timely responses to deviations from expected labour progress (WHO, 2021).

4. User-Friendly Design: The LCG is designed to be intuitive and easy to use for all skilled birth attendants, regardless of their training level or the healthcare setting. Its layout facilitates quick assessments and documentation, making it suitable for both high-resource and low-resource environments (Vogel et al., 2023).

5. Emphasis on Respectful Care: The LCG promotes respectful maternity care by encouraging providers to engage with women throughout the labour process, ensuring their preferences and needs are prioritized. This approach fosters a positive childbirth experience and empowers women to be active participants in their care (WHO, 2021).

The LCG has seven sections, which were adapted from the previous partograph design. They are;

1. Identifying information and labour characteristics at admission

2. Supportive care

3. Care of the baby

4. Care of the woman

5. Labour progress

6. Medication

7. Shared decision-making

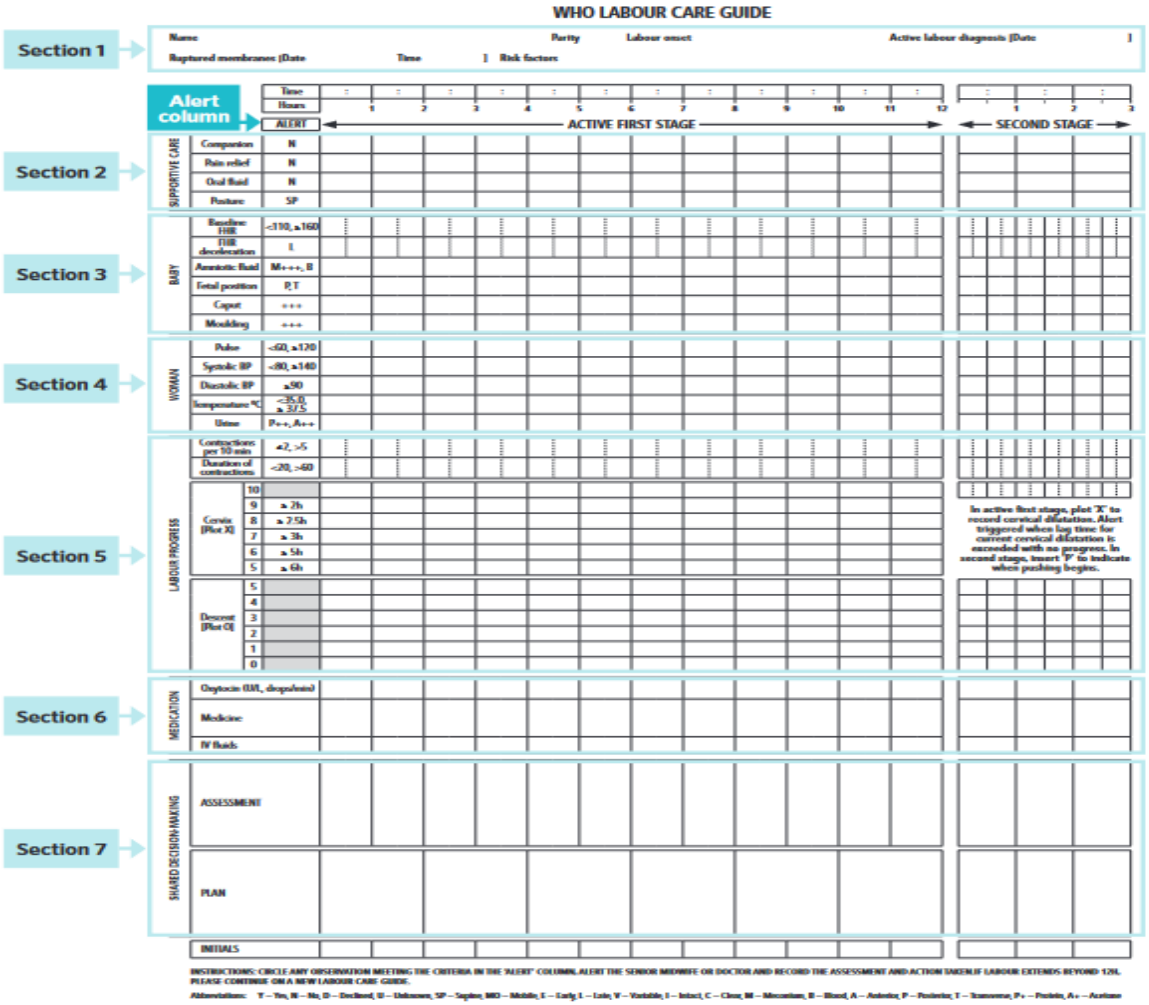


Figure 1. The Labour Care Guide

In clinical practice, midwives and other skilled birth attendants utilise the Labour Care Guide to monitor labour progress and provide care tailored to individual needs. The guide is implemented in various healthcare settings, including hospitals and community health centers, where it serves as a standard tool for intrapartum care. Healthcare providers are trained to use the LCG effectively, ensuring they can interpret the data collected and make informed decisions regarding interventions. Studies have shown that the implementation of the LCG can lead to improved maternal and neonatal outcomes, as

it encourages adherence to evidence-based practices and enhances communication among care providers (Mugyenyi, et al., 2024).

The LCG is also part of ongoing efforts to standardize labour monitoring globally, aligning with WHO guidelines to improve the quality of maternal health services. As healthcare facilities adopt the LCG, it is expected to contribute to reducing maternal mortality and enhancing the overall childbirth experience for women worldwide (WHO, 2021).

Benefits of Using Labour Care Guides

Labour Care Guides, offer several benefits that support midwifery practices such as;

1. Promoting Respectful Care through emphasis on the importance of providing respectful, woman-centered care throughout labour and childbirth. This aligns with the core principles of midwifery, which prioritize the emotional and physical well-being of the mother and baby (WHO, 2021).

2. It guide provides a structured approach to monitoring labour progress, fetal well-being, and maternal health parameters. This helps midwives identify potential complications early and intervene promptly, improving the quality of care (Pingray et al., 2021).

3. The Labour Care Guide documents supportive care interventions, such as labour companionship, pain relief options, and mobility. By incorporating these elements, the guide supports midwives in providing holistic, evidence-based care that enhances the birthing experience (WHO, 2021).

Impact on Clinical Decision-Making and Maternal Outcomes

1. Reducing Unnecessary Interventions: A study found that the use of Labour Care Guides significantly reduced primary cesarean delivery rates without increasing perinatal complications or the duration of hospital stay. This suggests that the guide helps midwives make more informed decisions about when to intervene, reducing the risk of unnecessary medical interventions (Shafti & Haghollahi, 2023).

2. Improving Labour Outcomes: The tool has been associated with shorter active labour phases and better overall labour outcomes. By providing clear guidelines for monitoring labour progress and triggering appropriate interventions, the guide supports midwives in managing labour effectively (Shafti & Haghollahi, 2023).

3. Enhancing Maternal and Perinatal Health: Ultimately, the implementation of Labour Care Guides has the potential to improve maternal and perinatal health outcomes. By supporting midwifery practices, promoting respectful care, and enhancing clinical decision-making, the guide contributes to reducing maternal mortality and morbidity, aligning with global health priorities (WHO, 2021).

Labour Care Guides as a Moderator in Achieving SDG

Labour Care Guides (LCGs), serve as a critical tool in moderating the relationship between midwifery practices and maternal health outcomes, specifically in the context of achieving Sustainable Development Goal (SDG) 3.1, which aims to reduce maternal mortality to less than 70 deaths per 100,000 live births by 2030. The moderating role of LCGs can be understood through their ability to enhance midwifery practices, improve clinical decision-making, and ultimately lead to better maternal health outcomes. This is a tool designed to support skilled birth attendants by providing a structured approach to labour monitoring that emphasizes evidence-based, respectful care. By integrating key assessments and supportive care interventions, it enhances the quality of midwifery practices, leading to improved maternal experiences and outcomes (WHO, 2021). It encourages midwives to adopt a holistic approach, which includes emotional support, pain management, and active participation of women in their care (Pingray et al., 2021). This enhanced practice directly influences maternal health outcomes by promoting a positive childbirth experience, which is crucial for reducing maternal mortality. The LCG also serves as a decision-making tool that provides clear guidelines for monitoring labour progress and identifying potential complications. By establishing thresholds for clinical interventions, the LCG helps midwives make informed decisions regarding when to escalate care (Shafti & Haghollahi, 2023). This structured approach reduces the likelihood of unnecessary interventions, such as cesarean deliveries, which can be associated with increased maternal morbidity and mortality (Pingray et al., 2021). Research indicates that the implementation of LCGs has led to a significant reduction in primary cesarean delivery rates without compromising maternal and neonatal safety (Shafti & Haghollahi, 2023). The use of LCGs has the potential to significantly improve maternal outcomes by providing a standardized framework for care that aligns with the latest evidence-based guidelines. Studies have shown that the adoption of LCGs is associated with

shorter labour durations, reduced rates of labour complications, and improved maternal satisfaction (Mugyenyi, et al., 2024). By facilitating timely interventions and promoting respectful care, LCGs contribute to lowering maternal mortality rates, thereby supporting the achievement of SDG 3.1.

Specific Ways in Which Labour Care Guides Enhance, Modify, or Stabilize the Effectiveness of Midwifery Practices

1. Enhancing Evidence-Based Care

One of the primary functions of the LCG is to promote evidence-based care during labour. The guide incorporates the latest WHO recommendations for labour management, emphasizing the importance of continuous monitoring of maternal and fetal health (WHO, 2021). By providing clear guidelines for assessing labour progress, the LCG helps midwives implement best practices, which can lead to improved outcomes. For instance, a study conducted in India demonstrated that the use of the LCG significantly reduced the rate of primary cesarean deliveries from 17.8% to 1.5% without increasing maternal or neonatal complications (Shafti & Haghollahi, 2023). This reduction highlights how LCGs can enhance midwifery practices by encouraging adherence to evidence-based interventions.

2. Modifying Clinical Decision-Making

The LCG modifies clinical decision-making by providing a structured approach to labour monitoring. It includes specific parameters and alerts that guide midwives in identifying deviations from expected labour progress and determining appropriate interventions (Pingray et al., 2021). This structured framework not only improves the consistency of care provided by midwives but also fosters critical thinking and individualized care. For example, the LCG encourages midwives to document supportive care interventions, such as labour companionship and pain management, which are essential for promoting a positive childbirth experience (WHO, 2021). By modifying decision-making processes, the LCG empowers midwives to respond effectively to the unique needs of each birthing woman.

3. Stabilizing Quality of Care

The LCG stabilizes the quality of midwifery care by standardizing practices across different healthcare settings. Its implementation has been associated with improved usability and acceptability among healthcare providers, as evidenced by a multicountry evaluation that assessed the feasibility of the LCG in various contexts (Patabendige et al., 2021). The guide's user-friendly design facilitates its integration into routine practice, ensuring that midwives can consistently apply its principles regardless of their training background or the resources available in their healthcare facility. This standardization is crucial for maintaining high-quality care and reducing variability in maternal and neonatal outcomes.

4. Supporting Respectful Maternity Care

The LCG emphasizes the importance of respectful maternity care, which is a fundamental aspect of midwifery practice. By promoting woman-centered care, the LCG encourages midwives to engage with women throughout the labour process, ensuring that their preferences and needs are prioritized (WHO, 2021). This focus on respectful care not only enhances the overall childbirth experience but also contributes to better maternal mental health outcomes, as women who feel supported during labour are more likely to report satisfaction with their care.

The introduction of Labour Care Guides in Nigeria has been part of broader efforts to improve maternal health outcomes by enhancing the quality of care provided during labour and delivery. Studies have shown that the use of LCGs can significantly reduce the incidence of complications during childbirth by ensuring that healthcare providers follow evidence-based practices (Oladapo et al., 2018). For instance, LCGs help in the early detection and management of conditions such as obstructed labour, pre-eclampsia, and postpartum hemorrhage, which are leading causes of maternal mortality in Nigeria (Okoli et al., 2014). The implementation of LCGs in Nigeria has faced several challenges, including resistance from healthcare providers who are accustomed to traditional practices, limited training on the use of the guides, and inadequate support from healthcare institutions (Abimbola et al., 2012). Despite these challenges, there is evidence that when properly implemented, LCGs can play a crucial role in reducing maternal mortality by improving the quality of care provided during childbirth (WHO, 2020).

The WHO has advocated for the adoption of Labour Care Guides across multiple countries, emphasizing their role in improving respectful maternity care and accurate assessments of fetal well-being (WHO, 2021). Countries such as Kenya and Tanzania have begun integrating the LCG into their maternal health policies, focusing on training healthcare providers and updating healthcare infrastructure to support the use of the guide. These initiatives have shown promising results, with early reports indicating improved maternal satisfaction and reduced complications during labour. By providing a standardized framework for care, the LCG stabilizes

midwifery practices and enhances the effectiveness of maternal health services in diverse settings.

Several studies have examined the impact of Labour Care Guides (LCGs) as a moderator in improving midwifery practices and maternal outcomes. A key study presented at the 5th Global Midwifery Symposium emphasized that well-trained midwives can provide up to 90% of essential sexual, reproductive, maternal, and newborn health services. The UN Population Fund (UNFPA) reported that increasing access to skilled midwives supported by LCGs could prevent over two-thirds of maternal and newborn deaths globally (UNFPA 2023). A mixed-methods evaluation conducted in Argentina, India, Kenya, Malawi, Nigeria, and Tanzania found that the majority of women (91.6%) who were monitored using the LCG had a spontaneous vaginal birth, with only two cases of intrapartum stillbirths (1.63 per 1000 births) reported (Vogel et al., 2021). This suggests that the use of LCGs can contribute to better maternal and perinatal outcomes. A study in India demonstrated that the implementation of the LCG significantly reduced the rate of primary cesarean deliveries from 17.8% to 1.5% without increasing maternal or neonatal complications (Shafti & Haghollahi, 2023). This substantial reduction in unnecessary interventions highlights the potential of LCGs to optimize clinical decision-making and improve maternal health outcomes. Furthermore, a systematic review published in The Lancet indicated that midwife-led continuity of care supported by LCGs can reduce preterm births by 24% and improve overall maternal and neonatal outcomes (Renfrew et al., 2014). This evidence underscores the importance of providing continuous, woman-centered care during labour and childbirth, which is a key focus of LCGs. The UN Population Fund (UNFPA) reported that increasing access to skilled midwives supported by LCGs could prevent over two-thirds of maternal and newborn deaths globally (UNFPA, 2023). This statistic highlights the significant potential impact of LCGs in reducing maternal mortality and improving maternal health outcomes worldwide.

4.0 DISCUSSION OF RESULTS AND INTERPRETATION

The available evidence suggests that Labour Care Guides (LCGs) play a significant moderating role in enhancing the impact of midwifery practices on maternal health outcomes. Several key findings support this conclusion:

1. Improved maternal and perinatal outcomes: Studies have shown that the use of LCGs is associated with better maternal and perinatal outcomes, including higher rates of spontaneous vaginal births (91.6%) and lower rates of intrapartum stillbirths (1.63 per 1000 births) (Vogel et al., 2021). This indicates that LCGs can help midwives provide more effective care, leading to improved health outcomes for mothers and babies.

2. Reduced rates of unnecessary interventions: The implementation of LCGs has been linked to a substantial reduction in primary cesarean delivery rates, from 17.8% to 1.5% in one study, without increasing maternal or neonatal complications (Shafti & Haghollahi, 2023). By providing clear guidelines for monitoring labour progress and identifying complications, LCGs empower midwives to make informed decisions about when to intervene, reducing the risk of unnecessary medical interventions.

3. Improved quality of care: Midwives have reported that using LCGs encourages them to provide more comprehensive, woman-centered care during labour. The guides promote respectful maternity care, support critical thinking in labour management, and enhance the overall quality of care delivered by midwives (Pingray et al., 2021). This improved quality of care directly contributes to better maternal health outcomes.

4. Standardization of practices: LCGs help standardize midwifery practices across different healthcare settings, ensuring that women receive consistent, high-quality care regardless of their location or the resources available. This standardization is crucial for maintaining quality and reducing variability in maternal and neonatal outcomes (WHO, 2021).

5. Potential for scale-up: The WHO has advocated for the adoption of LCGs globally, recognizing their potential to improve maternal health outcomes. As more countries integrate LCGs into their maternal health policies and train midwives in their use, the impact on maternal mortality and morbidity could be significant. For example, the UNFPA reported that increasing access to skilled midwives supported by LCGs could prevent over two-thirds of maternal and newborn deaths globally (UNFPA, 2023).

5.0 CONCLUSION

Labour Care Guides represent a significant advancement in maternal healthcare, providing a structured framework for midwives to deliver high-quality, evidence-based care during labour and childbirth. As healthcare systems strive to achieve Sustainable Development Goal 3.1, the integration of LCGs into routine practice is crucial for reducing maternal mortality and improving maternal health outcomes globally. By prioritizing the adoption of LCGs, investing in training and resources, and engaging stakeholders at all levels, we can empower midwives to

fulfill their vital role in advancing maternal health and ensuring that every woman has access to safe, respectful, and quality care during pregnancy and childbirth.

Below are key recommendations for integrating LCGs more effectively.

1. Healthcare systems should prioritize training programs for midwives and other healthcare providers on the use of LCGs.
2. Successful implementation of LCGs requires adequate resources, including Infrastructure Improvements and Essential Equipment and Supplies.
3. Healthcare systems should develop policies that facilitate the adoption of LCGs, by Integrating LCGs into National Guidelines and Creating Supportive Environments.
4. Implementing robust monitoring and evaluation frameworks is essential for assessing the effectiveness of LCGs, Tracking Outcomes and Establishing channels for healthcare providers to share their experiences with LCGs.
5. Engaging stakeholders, including policymakers, healthcare providers, and community representatives, is important for successful implementation.

REFERENCES

Abimbola, S., Okoli, U., Olubajo, O., Abdullahi, M. J., & Pate, M. A. (2012). The Midwives Service Scheme in Nigeria. PLOS Medicine, 9(5), e1001211. https://doi.org/10.1371/journal.pmed.1001211

Adegoke, A., Utz, B., Msuya, S. E., & van den Broek, N. (2012). Skilled birth attendants: who is who? A descriptive study of definitions and roles from nine Sub Saharan African countries. PLOS ONE, 7(7), e40220. https://doi.org/10.1371/journal.pone.0040220

Adamu, Y. M., & Salihu, H. M. (2020). Barriers to the use of antenatal and obstetric care services in rural Kano, Nigeria. Journal of Obstetrics and Gynaecology, 22(6), 600-603. https://doi.org/10.1080/0144361021000020349

Mugyenyi, G. R., Byamugisha, J. K., Tumuhimbise, W., & Atukunda, E. C. (2024). Customization and acceptability of the WHO Labour Care Guide to improve labour monitoring among health workers in Uganda: An iterative development, mixed method study. PLOS Global Public Health https://www.ncbi.nlm.nih.gov/pmc/article/PMC11090317/

Mattison, CA, John N. Lavis, JN, Michael G. Wilson, MG, Hutton, EK and Dion, ML. (2020). A critical interpretive synthesis of the roles of midwives in health systems Health Research Policy and Systems 18:77 retrieved @https://doi.org/10.1186/s12961-020-00590-0

National Population Commission (NPC) [Nigeria] and ICF. (2019). Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF.

Okoli, U., Morris, L., Chukwujekwu, O., & Ezumah, N. (2014). A review of the Nigerian healthcare funding system and how it compares to that of South Africa, Europe and America. Journal of Medicine and Medical Sciences, 5(10), 474-481.

Okonofua, F., Ogu, R., Agholor, K., Okike, O., Abdus-salam, R., Gana, M., ... & Ibadin, S. (2018). Qualitative assessment of women's satisfaction with maternal health services in Nigeria. Reproductive Health, 15(1), 129. https://doi.org/10.1186/s12978-018-0577-5

Pingray, V., Bonet, M., Berrueta, M., …& Oladapo, O. T.,muge (2021). The development of the WHO Labour Care Guide: An international survey of maternity care providers. Reproductive Health, 18(1), 66. https://doi.org/10.1186/s12978-021-01074-2

Patabendige, M., Wickramasooriya, D. J., & Dasanayake, D. L. W. (2021). WHO Labor Care Guide as the next generation partogram: Revolutionising the quality of care during labor. European Journal of Midwifery, 5, 26. https://doi.org/10.18332/ejm/138597

Renfrew, M. J., McFadden, A., Bastos, M. H., Campbell, J., Channon, A. A., Cheung, N. F., ... & Downe, S. (2014). Midwifery and quality care: Findings from a new evidence-informed framework for maternal and newborn care. The Lancet, 384(9948), 1129-1145.

Shafti, V., & Haghollahi, F. (2023). The World Health Organization Labor Care Guide: Impact on reducing cesarean sections at a tertiary center. Fertility, Gynecology and Andrology, 3(1), e136218. https://doi.org/10.5812/fga-136218

Seguin, A. (2023). The Vital Role of Midwives in Reducing Maternal Mortality. Journal of Women's Health Care, 12(8), 675.

Thomas, J., & White, R. (2022). Midwifery practice and education: Current challenges and opportunities. Journal of Research in Nursing and Midwifery, 11(3), 1-10. https://doi.org/10.14303/jrnm.2022.13

Tareena, M. (2022). The impact of community midwives on maternal healthcare utilization. Health

Economics, 31(12), 2022-2035. https://doi.org/10.1002/hec.4640

Ujah, I. A., Aisien, O. A., Mutihir, J. T., Vanderjagt, D. J., Glew, R. H., & Uguru, V. E. (2005). Factors contributing to maternal mortality in North-Central Nigeria: A seventeen-year review. *African Journal of Reproductive Health, 9(3), 27-40.* https://doi.org/10.2307/3583455

UNFPA. (2023). *Curbing the alarming rates of maternal and newborn deaths.* Retrieved from https://esaro.unfpa.org/en/news/curbing-alarming-rates-maternal-and-newborn-deaths-unfpa-and-partners-call-urgent-action-invest

Vogel, J. P., Comrie-Thomson, L., Pingray, V., Gadama, L., Galadanci, H., Goudar, S., ... & Althabe, F. (2021). Usability, acceptability, and feasibility of the World Health Organization Labour Care Guide: A mixed-methods, multicountry evaluation. Birth, 48(1), 66-75. https://doi.org/10.1111/birt.12511

Vogel, JP., Pingray, V., Althabe, F., … (2023). Implementing the WHO Labour Care Guide to reduce the use of Caesarean section in four hospitals in India: protocol and statistical analysis plan for a pragmatic, stepped-wedge, cluster-randomized pilot trial *Reproductive Health 20:18* Retrieved @ www.https://doi.org/10.1186/s12978-022-01525-4

UNICEF (2024). UNICEF Data Retrieved from https://data.unicef.org/sdgs/goal-3-good-health-wellbeing/

United Nations Children's Fund (UNICEF). (2021). Maternal mortality. Retrieved from https://www.unicef.org/nigeria/maternal-mortality

United Nations. (2021). Goal 3: Ensure healthy lives and promote well-being for all at all ages. Retrieved from https://sdgs.un.org/goals/goal3

United Nations Population Fund (UNFPA). (2020). UNFPA Nigeria. https://nigeria.unfpa.org/en

UNFPA. (2023). Curbing the alarming rates of maternal and newborn deaths. Retrieved from https://esaro.unfpa.org/en/news/curbing-alarming-rates-maternal-and-newborn-deaths-unfpa-and-partners-call-urgent-action-invest

WHO (2018). Strengthening midwifery. Retrieved from https://www.who.int/news-room/fact-sheets/detail/maternal-mortality

WHO (2019). Trends in maternal mortality: 2000 to 2017. Retrieved from https://www.who.int/news-room/fact-sheets/detail/maternal-mortality

WHO (2018). Labour care guide: A tool for improving quality of care during labour and childbirth. Retrieved from https://www.who.int/publications/i/item/labour-care-guide

WHO (2021). WHO labour care guide: User's manual. Retrieved from https://www.who.int/publications-detail-redirect/9789240017566

WHO (2023). Maternal mortality. Retrieved from https://www.who.int/news-room/fact-sheets/detail/maternal-mortality

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ISLAMIC FINANCIAL CULTURE AS PANACEA TO POVERTY REDUCTION IN NIGERIA

Chukwunonso Francis Onoh[1] & Fortune Nneka Agu[2]
[1]Economics Department, National Open University of Nigeria
and
[2]Financial Studies Department, National Open University of Nigeria
conoh@noun.edu.ng

ABSTRACT
This study concerns assessing the influence of Islamic Financial Culture (IFC) as a strategy to reducing poverty in Nigeria. specifically, we assessed citizens level of understanding and the implications for reducing poverty. We reviewed extant literature (scoping review) to articulate the opinions and findings of scholars. Our findings show that generally, there is low level of understanding of IFC in Nigeria – even in the Muslim-dominated north. The IBs are yet to develop roots. There has only been one established Islamic Bank. Citizens in the north, according to literature are less educated and are not aware of the details of Islamic Banks. In the south, citizens are wary of the Islam as a violent religion. Both ignorance and bias culminate in making generic policies for non-interest banking which subsumes the Islamic Financing. Thus, the lacuna in these policies further limit the potentials for IBs to flourish. We recommend that more sensitization should be done across country to improve the potentials for IFC to help the poor

1.0 INTRODUCTION
Islamic financial culture (IFC) is relatively underpublicized in Nigeria. Few citizens especially in the Christian-dominated southern part of Nigeria are aware of it and even in the Muslim-dominated north, not many citizens understand its precepts, concepts and economic importance (Dabor and Aggreh, 2017). Further, few among the financially-enlightened citizens across the nation hardly consider it in their business plan, if any, it is an afterthought. Nonetheless, scholars argue that Islamic Banking (the most crucial component of IFC) is gaining traction from the middle east – its source to developed western countries (Aliyu, 2012). Proponents of Islamic banking argue against the debt burden, social and financial inequality and unemployment, they claim are occasioned by the exchanges in the conventional and secular banking system. What is Islamic financial culture (henceforth used interchangeably with Islamic Banking)? How does it proffer solutions to the current economic malaise in Nigeria when compared to the conventional and secular banking alternative? This paper therefore concerns itself by assessing the extent Islamic banking remains a panacea to poverty reduction in Nigeria

Scholars like Ibrahim and Adnan (2018) define Islamic Finance as a financial system that offers products, services and financial instruments based on the Islamic law (Shariah). Such services include the alternatives to conventional services and products such as the Islamic banking, Islamic capital markets and Islamic insurance. Islamic banking captures the ethics and value system of lslam as enshrined in the Sharia law. It is an interest-less form of sourcing and accessing capital (Siyanbola, 2013). To this effect, it forbids 'riba' or usury, which is the "the premium that must be paid by the borrower to the lender along with the principal amount as a condition for the loan or for an extension in its maturity" (Muhammad and Buang, 2017). Some other major principles of Islamic banking include prohibition of uncertainty in contractual terms and conditions; parties are to share both profit and loss associated with each transaction; prohibition of unethical investment investing in alcohol, pornography, gambling, etc.; Also prohibited in the IBF system are dealings in pork, arms and ammunition. Each transaction must be tied to a tangible and identifiable underlying asset. (Aliyu, 2012) cites the following as authority inspired by Islam for Islamic banking "…on the authority of 'Abu Sa'rd Al-Khudriy; The Messenger of Allah (pbuh) said: "Gold for gold, silver for silver, wheat for wheat, barley for barley, dates for dates, and salt for salt; like for like, hand to hand, in equal amounts; and any increase is Riba.". Also that " …on the authority of 'Abu Sa'rd Al-Khudriy: Bilal visited the Messenger of Allah (pbuh) with some high-quality dates, and the Prophet (pbuh) inquired about their source. Bilal explained that he traded two volumes of lower quality dates for one volume of higher quality. The Messenger of Allah (pbuh) said: "this is precisely the forbidden Riba! Do not do this. instead, sell the first type of dates, and use the proceeds to buy the other."

From these principles, modern scholars espouse their displeasure with the conventional interest-driven secular banking. They argue that interest should not and cannot be the price for money; that money has no intrinsic utility, it is only a medium of exchange and a unit of

account; that Each unit of money is 100 per cent equal to another unit of the same currency and that there is no room for making profit through the exchange of money (see Muhammad (1999, (Chapra, 1981; Siddiqi,1983u; Ausaf, 1987; Gusau and Bawa, 1993; and Mahmoud, 2000 and Abdullahi, 2010). Some others further argue that since profit is generated when something with intrinsic utility is sold for money and or when different currencies are traded, profit resulting from dealing in money of the same currency or the papers representing them is interest, and is hence prohibited (see Abdullahi, 2020 citing Radcliffe Committee, 1959; Chapra, 1988;and Gusau and Aliyu, 1995**)**. These views are as teased from the Quran and Hadith (sources of Sharia) posit that "interest is evil and destroys not only individual but a nation, and it is capable of grounding the global economy and "Allah hath blighted usury and made alms giving fruitful. Allah loveth not the impious and guilty"(Qur'an Chapter 2 verse 276) (Abdullahi 2010 op cit.)

Conversely, supporters of the conventional banking system argue that interest is the cost of capital and should not be free. interest has been used over the centuries and still seen as an important monetary policy instrument in monetary management by monetary authorities (like central or national banks) in most countries of the world. For instance, in Nigeria the Monetary Policy Rate (MPR) of the Central Bank of Nigeria (CBN) benchmarked the expected lending and deposit rates in the money market of the Nigerian financial sector (Momodu, 2013; Ogiji, 2021). They further argue that the key role of interest encourages efficient and effective allocation of funds through increased savings and borrowing amongst the people, and thus, it is a reward for money kept or lent to someone for whatever purpose (production or consumption loan). (see Abdullahi et al, 2020; Ogiji, 2021)

Poverty reduction remains the ultimate goal in monetary policies – to influence access to credit for increased capital formation for enterprise. The CBN through the former Governor Sanusi Lamido Sanusi attempted to popularize it in 2012 but his regime was cut short and a non-Muslim, Godwin Emefiele his successor didn't continue to spread it. From a policy standpoint, the CBN governor has the discretion to influence the spread of the Islamic bank (see details in Section 2**),** but the religious diversity of Nigeria remains a factor especially as the CBN governors in their successions are not Muslims and hinders its possible awareness and use. In spite of the religious bias, what in its merit does the IFC hold for poverty reduction in Nigeria? this paper seeks to respond to this question.

1.1 The goals and objective of the study

The goal of this study therefore is to assess the extent IFC has influenced poverty reduction in Nigeria

1.2 The objectives of the study

1. To assess the level of understanding of Islamic Financial Culture in Nigeria
2. To assess its implications for poverty reduction in Nigeria

For the first objective, we assess Nigerians' level of understanding of the precepts and concepts of IFC. We therefore expound on the details of the culture – products and services required by the Islamic financing. For the second objective, we assess the benefits of the IFC at the macro level in terms of accessing funding for infrastructure. This is the indirect benefit for poverty reduction. At the micro level, we assess the potentials for IFCs if any, for financial inclusion of the unbanked poor.

The rest of the paper is structured as follows: in Section 2, we briefly review related literature in terms of setup, changes and challenges of the IFCs. In Section 3 we also briefly summarize the methodology. In Section 4, we articulate the findings from literature search and in Section 5, we summarize and conclude.

2.0. BRIEF LITERATURE REVIEW

Literature is awash with the advantages of modern banks for stimulating growth and development via tested monetary policies and theories. There are arguments that espouse the disadvantages of the conventional banks. Abdullahi (2010) states that global inequalities, inequities and hence exploitation of the poor and high debt burden stimulated by the conventional banks are avoidable in the IBs. Studies however, shows that IFCs and IBs are more successful in Muslim-dominated countries unlike what obtains in religious-plural countries like Nigeria. thus, there are hindrances to the spread of IFCs in non-Muslim countries (See Ibrahim and Adnan, 2018). Yahaya et al (2020) notes that for IFCs to spread, it is imperative to identify the challenges or lacuna in policy thrusts that seeks to spread it. And Abdullahi (2010) articulates The BOFIA Decree No. 25 of 1991 is the parent law that births the current CBN Act of 2007 that further enhances the autonomy of the Central Banks of Nigeria (CBN), which in turn empowers her to grant license to "specialized banks". The specialized banks are groups of banks different from the conventional banks and among them shall be profit and loss sharing banks and non-interest banks. The IBs are part of the latter based on their principles of Sharia earlier stated. Ogiji (2021) further explains that from this

policy There can also be other non-Islamic non-interest banks. he makes a fundamental observation worth noting – that the law however provides for the protection or incentivization of these specialized banks at the discretion of the Governor of the CBN (Abudullahi, et al, 2020; Muhammad and Dauda, 2018)

Challenges of Islamic Financing

The potential and actual issues with success of IBs can be generalized in two prongs – issues from perception of non-Muslims concerning the IB and issues of the law and policy. Starting with the latter, Siyanbola (2013) earlier indicated the gap in policy for effective spread and uptake of IBs, that is, the generic nature of the policies that support establishment of non-interest banking for which the IBs belong. Policies should have been made to support IBs specifically. Further, the policy requires it to depend on the discretion of the Governor of the CBN to determine extent of full implementation. For example, Abdullahi **(2010)** observes that the Act does not require the inclusion of memorandum and articles of association of the prospective Islamic bank which will spell out the establishment, composition, and qualifications of the members of board. He also indicates that The Act also does not make the proviso for the establishment of the Shariah Advisory Board. This may pose challenge in the future as there may be the need to determine the validity of possible changes and challenges in the interpretations of the Sharia requirements. This is supported according to Aliyu **(**2012**)** that Allah encourages regular consultations

Ogiji (2021) however, notes that the IBs and conventional banks are inherently contradictory, necessitating the need for policy flexibility, especially in a loan-based economy. Thus, there is need for policies to "accommodate" the IBs. His position indicates the near-impossibility of IBs to even thrive and hence requires some forms of moral suasion. Muhammad and Dauda (2018) however, makes his case more objective by stating how the IBs are fraught with more risks than the conventional banks – that they pose two types of risks – those similar to those faced by traditional financial intermediaries and those that are unique, owing to their compliance with Shariah. Unfortunately, according to him, there are no more effective risk-mitigating mechanisms by the IBs. He summarizes the IB risks as follows:

1. **Credit risk:** the probable loss of income, as a result of the counterparty's delay in payment, in part or in full, as contractually agreed can undermine all Islamic modes of finance.
2. **Liquidity risk:** Islamic banks are prone to serious liquidity risks. First, there is a *fiqh* restriction on the securitization of the existing assets of Islamic banks, which are predominantly debt in nature. Second, because of the slow development of financial instruments, Islamic banks are also unable to raise funds quickly from the markets.
3. **Market risks:** This can be systematic, arising from macro sources, or unsystematic, being asset or instrument specific. For example, currency and equity price risks would fall under the systematic category, and the movement in the prices of the commodity or in which asset the bank is dealing will fall under specific market risk.
4. **Mark-up risk:** Islamic financial institutions use a benchmark rate to price different financial instruments. E.g. the nature of a *Murabaha* is such that the mark-up is fixed for the duration of the contract. Consequently, if the benchmark rate changes, the mark-up rates on these fixed income contracts cannot be adjusted.
5. **Commodity/asset price risk:** arises as a result of the bank holding Commodities or durable assets as in *salam, ijara,* and *mudaraba/musharaka.*

Abdullahi et al (2020) notes that these risk or limitation led to the failing of the first and only fully operating Islamic Bank in Nigeria – the Jaiz Bank. He stated that It recorded an operating loss of N1.07 billion loss in 2012. This loss was attributed by Mr. Umaru Mutallab, the Chairman, Board of Directors of the Bank, to lack of Sharia compliant liquidity management instruments (citing Premium Times, 2013).

Some scholars conversely, argue that the risk management of the conventional banks are better with the instrumentality of the Central Banks. Ulrich Bindseil (2000) indicates that the liquidity management of a Central Bank is the framework, set of instruments and rules the Central Bank uses in steering the amount of bank reserves in order to control their price (i.e. short-term interest rates) consistent with its ultimate goals (e.g. price stability). Thus, Momodu (2013) notes that the Central in this regard is hamstrung in customize Sharia compliant liquidity management instruments, especially considering its non-interest operation, continues to hamper growth in the Islamic banking sector and challenge its viability in the face of obtainable legal framework. Ogiji (2021) notes that the Islamic Banks are further limited in their risk management due to the limited supply of Shariah-compliant Short-term papers (CDs, CPs), limited access to subordinated debt, almost no Islamic hybrids issued so far, and the need for risk-free Sukuk for liquidity and repo.

In terms of perception of potential customers as a limitation of the spread and influence of IBs, Siyanbola (2013) argues that the policy lacuna that generalizes the policy for non-interest banks and hence does not make any IB-exclusive preserve reflects the bias against the IBs especially among the non-Muslims. Several scholars further note that the IBs are largely successful in Muslim-dominated countries in the Middle East and Asia. In Nigeria, Muslims and non-Muslims share almost equal distribution. It is therefore plausible to argue on face value that the lacuna purported earlier in the CBN Act enables a more flexible approach to the running the IBs and therefore allows its popularity to be more driven by the markets rather than by policy **(**Abdullahi et al, 2020)

3.0. METHODOLOGY

We adopt a qualitative approach to answer the research questions. We adopt a scoping review of literature to assess scholars' opinions and findings on the citizens' understanding of IFCs, its determinants and implications for poverty reduction.

4.0. FINDINGS

This section concerns the finding from empirically scoping reviewing of related literature. Thus, we answer the research questions by describing citizens level of understanding of Islamic Finance and its effects and implications for poverty reduction

4.1. level of understanding of IFCs in Nigeria

Despite the good intentions and arguments to advance the cause of IBs, findings from literature show that most of the citizens don't understand the policy motivations and the challenges of the IBs. This is indicated in the fewness of IBs in Nigeria. The only known IB is the Jaiz Bank. Habib Bank is one of a few other banks that has units for non-interest services[51] **(**see Momodu, 2013; Abdullahi, 2010). This lack of spread makes it difficult for IBs to advertise their products and services. However, more fundamental reasons for poor awareness is the perception and policy challenge even in the Northern Nigeria**.**

Yahaya and Haji-Othman (2020) notes some of the barriers to the knowledge of IBs in Jigawa state include: Dearth of knowledge, skills and technical capacity to regulate, and supervise the system. Lack of *shari'ah*-compliant liquidity management instruments since Islamic banks cannot invest their excess liquidity in interest-based instruments; Absence of Islamic insurance (Takaful) to protect investments of Islamic banks against unforeseen hazards and facilitate the growth of the industry respectively. Others are the lack of a deposit insurance scheme for the protection of depositors of Islamic banks, Lack of knowledge of accounting and auditing standards pertinent to Islamic financial institutions, Lack of a robust and comprehensive legal framework, especially for conflicts resolutions involving Islamic finance contracts, products or entities. These challenges further bother on the poor distribution or lack of sharia scholars in conventional economics, law, accounting, banking and finance to interpret and educate the masses on the pros and cons of IFCs, the IBs and conventional banking. Ibrahim and Adnan (2018) from the foregoing indicates that Jigawa state still has potentials to adopt IFCs full scale if the challenges are overcome

Yahaya et al (2020) corroborates the above using OLS regression analyses and found out that poor education influences the poor adoption of IFC in northern Nigeria. Mohammed et al (2016) earlier used tested the Theory of Reasoned Action (TRA) examined the level of acceptance of an Islamic micro-investment model (IMIM) in Kano State, Nigeria. This was to over-come the challenges of conventional microfinance that is based on interest, as well as challenges facing Islamic microfinance themselves, which include cost of capital, human resource, and poverty alleviation. Using Structural Equation Modelling to analyze data from 500 respondents, the study found that citizens attitude influenced their disposition to using IBs. Attitude in this regard, concerns their fixation on the traditional approach to banking they are already familiar with. This is further reinforced by lack of scholars to explain the departures of IBs from conventional banking systems. There were also challenges in getting the indigenes in the rural areas to get into the banking system – whether Islamic or not.

Across Nigeria (Siyanbola, 2018) found like other scholars that assessed IBs adoption in the north, that lack of trained personnel also poses a great challenge on the growth of Islamic banking in Nigeria. Furthermore, he concluded that Islamic banking if properly implemented will lead to even distribution of resource and provides job opportunities for young Nigerians. He recommended that Nigerian Islamic banking Institutions should send their employees for comprehensive training that will

[51] and Stanbic IBTC - Non-Interest (Islamic) Banking Window. Concerning Islamic Insurance (Takaful) there were Takaful windows in Africa Alliance Insurance Plc, Niger Insurance Plc, and Halal Takaful, a division of Cornerstone Insurance Plc. Then on Islamic Capital Markets, there were: Lotus Capital Plc and Halal Fund of ARM. But none of the above was available in Jigawa State [Ibrahim and Adnan, 2018]

equip them with knowledge in Islamic finance and its operations. It was also recommended that Islamic banks should organize customer awareness programs to enlighten customers on Islamic finance. Finally, the study recommended that Islamic banks should concentrate more on loan products that meet the personal need of the average Nigerian.

4.2. implications for Poverty Alleviation

This section highlights the findings from literature on the extent IBs actually or potentially can reduce poverty in Nigeria. our findings show that the IFCs possess more of potentials for poverty reduction than in actual sense. Siyanbola (2018) summarizes the (potential) benefits of IFCs to include: More just and equitable distribution of resources; more responsible and profitable lending due to the necessity closer bank-client relationships; less volatile business cycles; more stable banking system; increased saving mobilization; improved real sector; creation of employment opportunities; Promotion of SMEs; promotion of foreign direct investment; relative efficiency of the interest free money system over the alternative interest based system. These benefits have been demonstrated abroad – in the Muslim-dominated countries. To this effect It is instructive to expound on the tools or products/services for Islamic financing that elicit these benefits to reduce poverty. These tools include (See Siyanbola, 2013; Abdullahi, 2010; Ogiji, 2020):

1. **Bai'al inah (Sale and Buy-back agreement):** This is a financing facility to buy and sell transactions between the financier and the customer. The financier buys an asset from the customer on spot basis. The price paid by the financier constitutes the disbursement under the facility. Subsequently, the asset is sold to the customer on a deferred payment basis and the price is payable on installments. The second sale serves to create the obligation on the part of the customer under the facility.
2. **Bai'bithaman ajil (deffered payment sale):** This concept refers to the sale of goods on a deferred payment basis at a price, which includes a profit margin, agreed to by both parties. Like *Bai'al inah,* this concept is also used under an Islamic financing facility. Interest payment can be avoided as the customer is paying the sale price, which is not the same as interest charged on a loan. The problem here is that, this includes linking two transactions in one, which is forbidden in Islam.
3. **Bai'muajjal (Credit Sale):** It is literally called credit sale but technically it takes the form of *murabahah muajjal.* It is a contract in which the bank earns a profit margin on the purchase price and allows the buyer to pay the price of the commodity at the future date in a lump sum or in installments. It has to expressly mention cost of the commodity and the margin of profit is mutually agreed. The price fixed for the commodity in such a transaction can be the same as the spot price or higher or lower than the spot price.
4. **Musharakah (Joint Venture):** This is an agreement between two or more partners, whereby each partner provides funds to be used in a venture. Profits made are shared between the partners according to the invested capital. In case of loss, each partner loses capital in the same ratio. If the bank provides capital, the same conditions apply.
5. **Mudharabah (Profit sharing):** This is a special kind of partnership where one partner gives money to another to invest it in a commercial enterprise. The investment comes from the first partner, who is called *rabb-ulmal* while the management and the work is an exclusive responsibility of the other called *mudarib.* Profits generated are shared between the parties according to a pre-agreed ratio.
6. **Murabahah:** This refers to the sale of goods at a price, which includes a profit margin agreed, to both parties. The purchase and selling price, other costs and the profit margin must be clearly stated at the time of the sale. The bank is compensated for the time value of its money in form of profit margin. This is a fixed income loan for the purchase of a real asset, such as real estate or vehicle, with a fixed rate of profit determined by the profit margin. The bank is not compensated of the time value of money outside of the contracted term (i.e. the bank cannot charge additional profit on late payment), however, the asset remains as a mortgage with the bank until the default is settled.
7. **Musawamah:** This is the negotiation of selling price between two parties without reference by the seller to either cost or asking price. While the seller may or may not have full knowledge of the cost of item being negotiated, they are under no obligation to reveal this cost as part of the negotiation process. The difference in obligation by the seller is the key distinction between *Murabahah* and *Musawamah* with all other rules as described in *Murabahah* remaining the same.
8. **Bai Salam:** This means a contract in which advance payment is made for goods to be delivered later. The seller undertakes to supply some specific goods to the buyer at a future date in exchange of an advance price fully paid at the time of contract. It is necessary that the quality of the commodity intended to be purchased is fully specified, leaving no ambiguity leading to dispute. The objects of this sale

is stock of goods and cannot be gold, silver or currencies based on metals. Barring this, *Bai Salam* covers almost everything that is capable of being definitely described as to quantity, quality and workmanship.

9. **Hibab (Gift):** This is a token given voluntarily by a creditor to a debtor in return for a loan. It usually arises in practice when islamic banks voluntarily paid their customers a gift on saving account balances, representing a portion of the profit made by using those saving account balances in other activities. It is important to note that, while it appears similar to interest, and may in effect, have the same outcome, *Hibab* is a voluntary payment made at the bank's discretion and cannot be guaranteed. However, the opportunity of receiving high *Hibab* will draw in customers' savings, providing the bank with funds necessary to create profits; if the ventures are profitable, then some of the profits may be gifted back to its customers as *Hibab.*
10. **Ijarah (Lease):** This means lease, rent or wage. Under this concept the bank makes available to the customer the use of service of assets/equipment for a fixed period and price.
11. **Ijarah Thuma al bai (Hire Purchase):** Parties enter into contract that come into effect socially, to form a complete lease/buyback transaction. The first contract is an *Ijarah*, that outlines the terms of leasing or renting over a fixed period and the second contract is a *Bai*, that triggers a sale or purchase once the term of the *Ijarah* is completed. For example, in a car financing facility, a customer enters into the first contract and leases the car from the owner (the bank) at an agreed amount over a specific period. When the lease period expires, the second contract comes into effect, which enables the customer to purchase the car at an agreed price. The bank generates a profit by determining in advance the cost of the item, its residual value at the end of the term and the time value or profit margin of the money being invested in purchasing the product to be leased for the intended term, the combining of these three figures becomes the basis of the contract between the bank and the client for the intial lease contract.
12. **Ijarah-wal-iqtina:** A contract under which an islamic bank provides equipment, building or other asset to the client against an agreed rental together with a unilateral undertaking by the bank or the client that at the end of the lease period, the ownership in the asset would be transferred to the lessee. The undertaking or the promise does not become an integral part of the lease contract to make it conditional. The rentals as well as the purchase price are fixed in such manner that the bank gets back its principal sum along with profits over the period of the lease.
13. **Qard Hassan/Qardul Hassan (Benevolent loan):** This is loan extended on a goodwill basis, and the debtor is only required to repay the amount borrowed. However, the debtor may, at his or her discretion, pay an extra amount beyond the principal amount of the loan (without promising it) as a token of appreciation to the creditor, this transaction is a true interest-free loan.
14. **Sukuk (Islamic bond):** *Sukus*, plural of *sakk*, is the Arabic name for financial certificates that are the Islamic equivalent of bonds. However, fixed income interest bearing bonds are not permissible in Islam. Hence sukuk are securities that comply with Islamic law, shariah, and its investment principles, which prohibits the charging or paying of interest.
15. **Takaful (Islamic Insurance):** This is a form of insurance cover that a muslim can avail himself against the risk of loss due to misfortune. *Takaful* is based on the idea that what is uncertain with respect to an individual may also be applicable to a very large number of similar individuals.
16. **Wadiah (Safekeeping):** Here, a bank is deemed as a keeper and trustee of funds. A person deposits funds in the bank and the bank guarantees refund of the entire amount of the deposit, or any part of the outstanding amount when the depositor demands it. The depositor at the bank's discretion, may be rewarded with *Hibah*, as a form of appreciation to the use of funds by the bank.
17. **Wakalah (Power of Attorney):** This occurs when a person appoints a representative to undertake transactions on his/her behalf, similar to a power of attorney in law.
18. **Riba:** Any increase in a loan or sale transaction which accrues to the lender, seller or buyer, without the provision of an equivalent counter value to the other party. In islam, riba is one of the most abhorrent of all sins and is absolutely prohibited. *Riba* encompasses various type of illicit gain, of which bank interest is one.
19. **Tawarruq:** This is reversed murabahah, here a customer with a genuine need buys something on credit from the bank on a deferred payment basis and then immediately resells it for cash to a third party. In this way, the customer can obtain cash without taking an interest-based loan.
20. **Kafalah (Loan guarantee):** This is the Assumption of the responsibility for debt repayment: A standard Islamic financial transaction in which Mr A (the *Kafil*) agrees to assume responsibility for the debt of Mr B (the *makful anhy*), similar but not identical to *Hawalah*.

21. **Khiyar:** The option extended to one or more of the parties in a sale contract to rescind the sale, upon the appearance of a defect, for example, the jurists have traditionally recognised several different types of *Khiyar*, including *Khiyar al-ruyah, Khiyar al-ayb, Khiyar al-shart* and *Khiyar al-majlis.*
22. **Khiyaral-short:** An option in a sale contract concluded at the time of signing the agreement giving one of the two parties to the contract a right to cancel the sale within a stipulated time.

We next turn to empirical evidence of the potential and/or actual effects of the IBs on poverty. Most of our findings are macroeconomic and hence are indirect benefits. At the microeconomic level We further assess the extent IFC and IBs directly reduce poverty in terms of financial inclusion of the masses. alleviation.

Macroeconomic Benefits

Muhammad (2018) show that IBF increases GDP in Nigeria with a Granger causality model. His findings are however, limited in data as he simply correlated funds disbursed by IBs and GDP. Outside of Nigeria, where IBs and IFCs are well accepted and regulated. Furqani and Mulyan (2009), employed the Vector Error Corrected Model (VECM) and found a positive effect of IBs on economic growth. He used the variables Gross Fixed Capital Formation (GFCF) for the analysis the trade and activities to represent real economic sectors. The findings revealed that in the long-run there is evidence of relationship between Gross Fixed Capital Formation and Islamic bank to support the demand of increase Gross Domestic Product causes by enhancing development of Islamic banks. Later, Farahani, Sadr and Hossein (2012) found positive results on the influence of IBs and economic growth in Indonesia and Iran using the Autoregressive Distributed Lag (ARDL) and error correlation models (ECMs). They found that in the long run IBs influenced significant capital accumulation of the countries and bears huge implications for poverty reduction.

For the United Arab Emirates (UAE), Dhankar and Tabash (2014) found using Granger Causality that The Islamic financing credited the private sector through a proxy mode of financing, Foreign Direct Investment (FDI), Gross Fixed Capital Formation (GFCF) which in turn influenced their growth of their Gross Domestic Product (GDP) proxied as real economic growth. Abusabha and Masound (2014) extended their analyses across the countries in the Middle East and North Africa (MENA) and estimating the ARDL and Granger causality models Islamic banking showed significance in their real economic sector developments. In effect, Islamic finance culture has proved to be successful in Muslim-dominated countries.

Returning to Nigeria, some studies show mixed findings. On the positive note, Siyanbola (2013) while the alternative hypothesis is accepted and conclude that interest free banking has significant effect on micro, small and medium enterprise in Nigeria. conversely, Dabor and Aggreh (2017) had a different finding – that Islamic banking has held less promise for poverty emancipation for Muslims and non-Muslims alike. They had mixed perception due to the diversity of Nigeria unlike the Muslim-dominated countries. Thus, they find out as earlier indicated that the heterogeneity, pluralism and diversity of the Nigerian state do not permit the creation of a bank with religious coloration. Ibrahim and Adnan **(2018)** further observed that respondents felt the CBN former governor who is a Muslim used tax payer's money to establish a religious bank. He concludes that Nigerian banking customers have preference for conventional banking system despite the high interest rates it charges because it meets their personal needs such as purchase of assets, landed property, car, household equipment and other contingencies such as funeral ceremonies and payment of school fee for their wards.

Rano (2012) had earlier extend the potential macroeconomic benefits by assessing the implications for poverty reduction in Nigeria if they access develop financing from Islamic Development Bank (IDB). For instance, Nigeria has benefited from long term capital flow through *sukuk* market. Other infrastructural support has been the National programme for Food Security, Zungeru dam project, Mambilla hydroelectric dam project, Lagos-Ibadan Expressway and National Railway Rehabilitation project as well as the Shagamu-Benin dual carriage project. On sukuk opportunities, Abdullahi (2011) argues that with interest bearing bond becoming increasingly costlier and difficult to arrange, sukuk with its elimination of interest and substituting it with rent or profit-sharing arrangement, is cheaper and tailored to benefit both sides, that is, both issuer and investor. In effect, international Islamic financing is crucial for financial market deepening which the cross-border capital flow could help to promote.

Financial Inclusion

Another poverty reduction benefit of Islamic financial support is its potential for financial inclusion. Adewusi (2011) argues that more citizens are most likely to access opportunities for significant price-adjustment of stocks with the absence of cost of capital challenges and changes and hence more opportunities for investment in stocks, but, constraints in the area of technology

efficiency, incentives, compulsory listing, capacity building, new products in offering, full disclosure, among others, are said to be critical in driving the market. Adewusi (2011 ibid.) argues that in effect, with effective regulations to support the advantages the Islamic financing offers, the apathy among non-bank public to accept the banking services that now suit their preferences and recognize their religious values and beliefs. Increased financial access to this effect will reduce poverty as there will be enhanced, economic activities such as production, employment, distribution, consumption, etc.

Yahaya and Othman (2020) narrowed their study of financial inclusion to the northern Nigeria. they used OLS regression analyses and descriptive analyses observe that there were significant barriers to financial inclusion of the citizens of northern Nigeria. the citizens still considered high cost of finance, lack of trust, irregular income, proximity and also lack of awareness and illiteracy have collectively served as a great challenge. Most of them are thus unaware of the difference between the secular banks and the Islamic bank. Most still were positive like other studies increase awareness of IBs hold promise for financial inclusion and poverty alleviation.

The foregoing studies assessed the demand for Islamic finance services, which shows that despite mixed views, is high. Further, demand is more effective if the policies are strengthened and strongly communicated to the masses. These studies did not profile the actual users of the IB to assess the extent they have rescued them from poverty. One of the few studies that assessed the customers of Jaiz Bank – the only accredited IB is Ibrahim and Adnan (2018) still on northern Nigeria figured no significant impact of the bank for financial inclusion. Jaiz Bank as indicated by other scholars faced numerous impediments in terms of regulation, people's patronage and competition with the fully established conventional banks in the country. Their findings using chi-square showed that coefficients of biased perception of Islamic religion, lack of manpower and moral hazards are significant determinants of non-financial inclusion.

Finally, Ibrahim an Othman (2020) observes that financial inclusion is difficult in northern Nigeria because the most of the citizens are in the informal sector. Players in the formal sector are essentially civil servants who statutorily use the conventional banks. thus, there is weak Small Medium-Scale Enterprises (SMEs) structure that may work for instance, with Islamic Microfinance Banks to inch the population closer to financial inclusion

5.0 SUMMARY AND CONCLUSION

5.1 summary

Our study attempts to assess the effects of Islamic Financial Culture (IFC) on possible poverty reduction in Nigeria. our findings show that IFC and IBs have impact in most Muslim-dominated countries in the Middle East and Asia. In fact, the IBs dominate the financial systems over the conventional ones. In principle, the IFCs and IBs are founded on zero-interest, no-cost-of-capital transactions in the credit and capital markets, based on the Sharia law. This is to the extent that risks, costs and profits are shared among parties in a transaction. Scholars argue that there are evidences of equality, equity in distribution and access to resources. Such scholars have blamed the inequality for most of the global and national financial crises and poverty. Thus, the propose that IFCs redistributes resources more effectively

In Nigeria, however, our population distribution in terms of religion is different. We are relatively equally distributed with the Islam dominating the north and Christianity dominating the south (Yahaya et al, 2016). Thus, perception bias and hence generic policies are the bane of the spread of IFC in Nigeria. Expounding further, our findings shows that non-Muslims are leery of getting converted (lured or cajoled) . Non-Muslims furthermore are not comfortable with some of the restrictive and illiberal doctrines and dogmas in Islam. To this effect, it became a bit difficult to push the policies for IBs in the monetary policy system. The policy for IFCs in Nigeria is generic. IFBs and related institutions are generalized and "non-interest" banks., indicating that there can be other non-Islamic banks. One consideration in the policy is that it allows the full-scale sale of the project to be at the discretion of the Governor of the CBN. Thus, a Muslim Governor may influence within policy constraints, customers' adoption of IFC and IB products and services. The last CBN governor to push in this regard is Sanusi L. In2009- 2014. Since then, the Governors have been non-Muslims, and have not made a case for IFCs

However, despite the extant policies on IFC in Nigeria, there is little evidence to show that it has reduced poverty. While there are abundance of theories and thesis on the benefits of IFC, most of the citizens, even of the Muslim northern Nigeria are not aware of IBs and then the benefits. This is because there are few IBs in Nigeria – the only one which is moribund is the Jaiz Bank. Policy wise, IBs have little potentials for poverty in the northern Nigeria. in the non-Muslim dominated south, our findings show that the negative perception of Islam

irrespective of the potential benefits is a significant barrier to IFCs adoption. This again, is a limitation to poverty reduction.

There are some indirect benefits nonetheless. This is on the macroeconomic levels. For instance, the government borrowing from sukuk bonds to provide infrastructure such as roads, bridges and electricity. Infrastructure therefore will provide enabling environment for the poor people to survive and thrive. What is missing in literature is the impact yet again of these infrastructure funded by products of IF on the lives of the poor people and hence the extent they reduce poverty.

5.2 Concluding Remarks

Our study concludes from the foregoing that Most of the knowledge of IF is on IB. little is known about other financial products. Existing knowledge is at the realm of 'theories' rather than practical's – it is still speculative based on evidence of the IFC success abroad. Poverty reduction due to IFCs and IBs are indirect in Nigeria for now. Government can borrow funds from Islamic Development Banks via the Sukuk funds for road, rail and other infrastructure which in turn may help stimulate business growth. In effect, since IFCs and IBs are little known in Nigeria due to bias in perception and generic nature of monetary policy for non-interest banking, it is difficult for it to then contribute to alleviating poverty. There has to be a lot of sensitization of potential customers to improve its perception and hence its potentials as panacea to improving lives and livelihoods of Nigerians. To this, we recommend the creation of a special body to regulate and promote Islamic financial culture and institutions in Nigeria to help in financial inclusion target and achieving Sustainable Development Goal of Poverty reduction.

REFERENCE

Abdullahi, I. (2010). Islamic Banking in Nigeria: issues and prospects. CBN Bullion. Vol. 34(2), pp. 36-42.

Abdullahi1, A., A. Othman and S. Kassim. (2020). Enhancing Financial Inclusion in Nigeria: The Role of Islamic Finance. International Research in Technology, Engineering, Science and Humanities (IJRTESH) Vol, 1(1). Pp 1 – 11.

Aliyu, S. (2012). Islamic banking and finance in Nigeria: issues, challenges and opportunities. MPRA Paper No. 42573, Online at https://mpra.ub.uni-muenchen.de/42573/

Dabor, A., and M. Aggreh. (2017). Islamic Banking in Nigeria: Prospects and Challenges. International Journal of Social Sciences & Educational Studies. Vol 4(1). ISSN 2520-0968 (Online), ISSN 2409-1294 (Print)

Ibrahim, B., and A. bin Adnan. (2018). The Development of Islamic Banking and Finance in Nigeria: Challenges for Jigawa State. Scholars Journal of Arts, Humanities and Social Sciences. Pp 153 – 159. 10.21276/sjahss.2018.6.1.27

Momodu, D. (2013). Legal Framework for Islamic Banking and Finance in Nigeria. Vol. 1 (2013). Electronic Journal of Islamic and Middle Eastern Law | Vol. 1 (2013). Pp 160 – 169.

Muhammad, B., and A. Buang. (2017). Legal Aspects of Islamic Banking and Finance in Nigeria. Shariah Journal, Vol. 25(2). pp 311-362

Muhammad, T., and S. Dauda. (2018). Islamic Finance in Promoting Economic Growth in Nigeria. South East Asia Journal of Contemporary Business, Economics and Law, Vol. 15(5). Pp 41 – 45. ISSN 2289-1560

Ogiji, P. (2021). Non-Interest (Islamic) Banking. Understanding Monetary Policy Series. No 16. Central Bank of Nigeria. C 2021

Siyanbola, T. (2013). Islamic Banking as A Panacea for Economic Instability in Nigeria. Arabian Journal of Business and Management Review (Nigerian Chapter) Vol. 1 (3). Pp 69 – 89.

Yahaya, S., A. Shinkafi, Y. Haji-Othman. (2020). Islamic Banking: A Panacea for Financial Inclusion in Northern Nigeria. International Conference on Contemporary Issues in Islamic Finance (e- ICCIIF 2020), October 2020 (eISBN 978-967-0405-52-0). Pp 8 – 21

Yahaya, S., I. Hamid, A. Bin Idris, Y. Haji-Othman. (2016). Adoption of Islamic Banking Products and Services in Nigeria: An Application of Diffusion of Innovation Theory. International Journal of Scientific Research in Science and Technology (IJSRST). Vol. 2 (3). Pp 264 – 272. Online ISSN: 2395-602X

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

DIGITAL TECHNOLOGY AND MENTAL WELL-BEING: FINDING A HEALTHY BALANCE

Aderonke Abolusodun & J.T. Oyeleke
Department of Psychology, Faculty of Management and Social Sciences, Leadcity University, Ibadan
ayoronke3d@gmail.com

ABSTRACT:
In today's digital age, technology has transformed every aspect of human life, from communication and education to healthcare and entertainment. While digital transformation has brought about many positive changes, it has also raised concerns about its impact on mental well-being. This paper examines the relationship between digital technology usage and mental well-being, emphasizing the need for a balanced approach to ensure that the benefits of digital transformation do not come at the expense of mental health. A quantitative research methodology was adopted, involving the collection and analysis of data through descriptive statistics, correlation analysis, and regression analysis. Data was gathered from a stratified random sample of academic staff across various faculties. The results revealed a significant relationship between digital engagement and mental well-being, with prolonged technology use associated with higher levels of stress, anxiety, and depression. Specifically, correlation analysis showed a negative relationship ($r = -0.65$, $p < 0.01$), while regression analysis indicated that digital engagement explained 42% of the variance in mental health outcomes ($R^2 = 0.42$, $p < 0.05$). These findings highlight the importance of developing strategies to promote mental well-being in a digitally driven world.

Keywords: *Digital transformation, mental well-being, technology use, quantitative analysis, stress, anxiety, depression*

1.0 INTRODUCTION

The rapid advancement of digital technologies has revolutionized various aspects of modern society, including how we work, communicate, and access information. Digital technology refers to the process of using electronic technologies to transform traditional and non-digital services or create new ones, thereby completely altering the way things are managed and operated (OECD, 2020). Digitalization involves developing processes and changing workflows to improve manual systems through the use of digital technologies. Mental health is defined as a state of complete emotional and psychological well-being, not merely the absence of disease or infirmity (World Health Organization, 2001). Digital technology has brought undeniable benefits, enabling businesses to modernize legacy processes, accelerate efficient workflows, strengthen security, and increase profitability (McKinsey & Company, 2021). Approximately 90% of companies are now conducting business in the cloud, which enhances business capabilities and operational efficiencies (Gartner, 2022). Additionally, digital technology enhances interpersonal connection through online communities, such as social media support groups, and online video tools, promoting self-esteem and a sense of belonging (Rosen et al., 2023). Innovations like virtual reality therapy and tele-therapy have shown effectiveness in treating various mental health conditions, and cognitive remediation apps help improve thinking skills for individuals with serious mental illnesses (Jones & Smith, 2022). Despite these benefits, there are concerns about the negative impact of digital technologies on mental health, including issues like cyberbullying, unrealistic comparisons, and the pressure to maintain online connectivity, leading to depression and diminished self-esteem (Kross et al., 2022). Prolonged technology use can increase the risk of mental health problems such as anxiety, depression, social isolation, loneliness, self-harm, and suicidal thoughts (Wang et al., 2023). The phenomenon of "fear of missing out" (FOMO) exacerbates feelings of inadequacy and dissatisfaction, negatively affecting mood and increasing anxiety and stress (Robinson et al., 2023). Understanding the complex interplay between digital technology and mental health is essential for developing effective strategies to promote well-being in a rapidly evolving technological landscape. This paper aims to uncover innovative approaches to harness the benefits of digitalization while mitigating its potential harms on mental health.

1.1 STATEMENT OF PROBLEM

Digital technology is rapidly changing how we live, work, and interact. Concurrently, mental health concerns are on the rise. Several issues emerge from this scenario:

1. Increased Anxiety and Depression: The pressure to constantly engage with digital platforms can lead to anxiety and depression. People feel compelled to stay updated and connected, causing stress and mental fatigue.

2. Social Isolation: While digital technologies connect people virtually, they can also lead to physical isolation. Over-reliance on digital interactions might reduce face-to-face engagements, leading to loneliness and social withdrawal.
3. Cyberbullying and Online Harassment: The anonymity and reach of the internet have given rise to cyberbullying and online harassment, significantly affecting the mental health of victims.
4. Unrealistic Comparisons and Low Self-Esteem: Social media platforms often present idealized versions of life, leading to unrealistic comparisons and feelings of inadequacy among users.
5. Work-Life Balance: The blurring of boundaries between work and personal life due to digital connectivity can lead to burnout and stress, negatively impacting mental health.
6. Addiction to Digital Devices: Prolonged use of digital devices can lead to addiction, disrupting sleep patterns, reducing productivity, and increasing the risk of mental health issues.
7. Fear of Missing Out (FOMO): The constant exposure to social media updates can cause individuals to feel that they are missing out on exciting or important events, contributing to anxiety and depression.
8. Sleep Disruption: Excessive screen time, particularly before bed, can interfere with sleep patterns, leading to insomnia and other sleep disorders that negatively affect mental health
.

1.2 OBJECTIVES

1 To investigate the effect of digital technology on mental health and well-being.
2. To identify potential risks and benefits associated with digital technology.
3. To provide recommendations for mitigating negative effects and maximizing positive outcomes.

1.3 HYPOTHESES

1. Digital technology will have a significant negative effect on mental health and well-being.
2. Digital technology will have significant potential risks and benefits, enhancing access to mental health resources and promoting social connections.
3. Digital technology effects can be mitigated through targeted strategies to maximize positive outcomes on mental health and well-being.

2.0 RELATED WORK

The literature on digital technology reveals a complex landscape of both positive and negative impacts on mental health and well-being. As digital technologies continue to evolve and integrate into various aspects of daily life, it is crucial to understand their dual-edged nature. On one hand, digital technology has facilitated access to mental health resources, created supportive online communities, and introduced innovative therapeutic tools. On the other hand, it has also contributed to increased anxiety, depression, and other mental health challenges. This section explores the multifaceted effects of digital technology by examining recent studies and findings. Recent studies have shown the dual-edged nature of digital technology. Digital health tools, such as mental health apps, have improved access to mental health services. Virtual therapy has become more accessible and effective, particularly during the COVID-19 pandemic (WHO, 2021). Online communities offer support and reduce feelings of isolation. Social media platforms can facilitate connections and provide a sense of belonging (Rosen et al., 2023). The adoption of telehealth services has increased, providing more people with access to mental health professionals, particularly in remote areas (Smith et al., 2023). Virtual reality therapy has shown promise in treating anxiety disorders and PTSD, offering immersive environments for exposure therapy (Jones & Smith, 2022). While the benefits of digital technology are significant, there are also considerable negative impacts that must be addressed. Excessive screen time has been linked to increased anxiety and depression. Studies have found correlations between high screen time and poor mental health outcomes (Kross et al., 2022; Wang et al., 2023). The prevalence of cyberbullying and online harassment is a significant concern, with substantial psychological impacts on victims (Pew Research Center, 2023). High usage of digital devices, especially before bedtime, disrupts sleep patterns, leading to poor sleep quality and increased mental health issues (Hale & Guan, 2022). The phenomenon of FOMO and unrealistic comparisons on social media can lead to decreased self-esteem and increased feelings of inadequacy (Robinson et al., 2023). Several recent studies highlight both the positive and negative impacts of digital technology on mental health. A study by Lee and Kim (2021) found that adolescents who spend more than three hours daily on social media are more likely to report symptoms of anxiety and depression. According to Smith et al. (2023), remote workers reported higher levels of stress and burnout compared to those working in traditional office settings, primarily due to the blurring of work-life boundaries. Research by Wang et al. (2023) indicates that digital

detox interventions, such as scheduled breaks from social media, can significantly improve mental well-being and reduce stress levels. These studies underscore the necessity of balancing the benefits and risks of digital technology. By understanding the multifaceted impacts, stakeholders can develop strategies to harness the positive aspects while mitigating the negative effects on mental health The research work is hinged on the following theories:

Technostress Theory: This was proposed by Craig Brod in 1984. It explains the stress experienced by individuals due to their inability to cope with new computer technologies in a healthy manner. Technostress arises when individuals struggle to cope with new technologies in a healthy manner. In the context of digital technology, rapid technological changes in workplaces can disrupt established routines and increase stress levels among employees. Implementation of new digital systems without sufficient training or support mechanisms can overwhelm employees, leading to stress and potential mental health issues.

Cognitive Load Theory: This was proposed by John Sweller in 1988. It posits that the human brain has a limited capacity for processing information, and excessive digital input can overload this capacity, leading to stress and decreased mental well-being. This theory posits that the human brain has a limited capacity for processing information. Excessive digital input, such as constant notifications and multitasking, can overwhelm cognitive resources, impair concentration, and contribute to stress and anxiety. Studies show that high levels of digital engagement can lead to cognitive fatigue and reduced productivity, highlighting the impact of information overload on mental well-being.

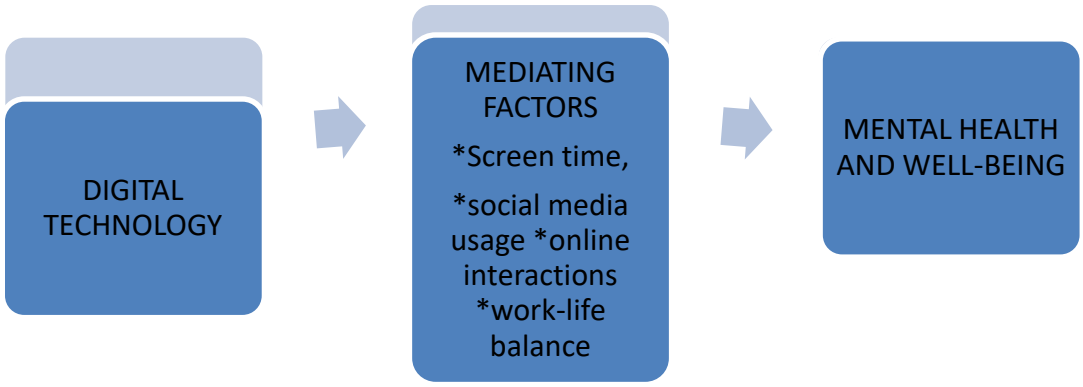
Social Comparison Theory: This was proposed by Leon Festinger in 1954. This theory suggests that individuals determine their own social and personal worth based on how they stack up against others. Social media intensifies this comparison, often leading to negative self-perception and mental health issues. Social media platforms intensify social comparison processes, where individuals evaluate their own worth based on comparisons with others. Idealized portrayals on social media can lead to feelings of inadequacy, decreased self-esteem, and heightened levels of stress and depression. Research indicates that frequent use of social media for comparison purposes correlates with negative psychological outcomes, emphasizing the role of digital platforms in shaping self-perception and mental health.

Uses and Gratifications Theory: This was proposed by Elihu Katz and Jay G in 1974. This theory explores how individuals use media to satisfy various needs, including cognitive, affective, personal integrative, social integrative, and tension release needs. The theory helps understand why people are drawn to digital technologies and the psychological outcomes of their use. This theory explores why individuals engage with digital technologies and how these interactions fulfil various needs, including social connection, entertainment, and information seeking. The manner in which people use digital platforms can impact their mental well-being positively or negatively. Utilization of mental health apps or participation in online support communities demonstrates how digital technologies can enhance access to mental health resources. Conversely, excessive use or misuse of digital media may contribute to mental health challenges.

The Digital Well-being Theory: This was proposed by Moritz Buchi , a researcher from the University of Zurich in 2020. The theory offers guidance for theory development and integration to enable a science of the effects of digital media use on well-being. The theory explains the nature and connections between digital practices, harms or benefits, and well being. This theory provides a framework for understanding the overall impact of digital technology on well-being. It acknowledges both the benefits (e.g., improved access to mental health services) and challenges (e.g., increased screen time, cyberbullying) posed by digital technologies. Initiatives promoting digital detox programs or mindfulness apps illustrate efforts to mitigate negative impacts of digital engagement on mental health, highlighting the importance of fostering a balanced approach to digital use.

CONCEPTUAL FRAMEWORK

This study's conceptual framework proposes that digital technology (independent variable) influences mental health and well-being (dependent variable) through several mediating factors, including screen time, social media usage, online interactions, and work-life balance. This framework elucidates the ways in which various elements of digital echnology impact mental health outcomes.



3.0 METHODOLOGY

This study utilized a quantitative research method through an online questionnaire for each target group. The survey collected data on participants' digital technology usage, mental health status, and well-being. The participants were mental health workers, remote workers and social media users. Data Collection

In this study, purposive sampling was employed to select the participants who are active users of digital technologies and have experienced digital technology in their personal and professional lives. The sample consisted of 200 participants from diverse backgrounds, including different age groups (18-65years), occupations (students, working professionals, and entrepreneurs, and geographical locations (urban areas) An online survey questionnaires distributed through various digital platforms, including social media and online forums to reach our target population. This sampling approach allowed us to gather data from a diverse and relevant group of participants who have experienced digital technology and its effects on their mental health and well-being.

3.1 Data Analysis

Descriptive Statistics: To summarize the participants' demographic data and technology usage patterns.

Correlation Analysis: To examine the relationships between variables such as screen time and mental health symptoms.

Regression Analysis: To identify predictors of mental health outcomes based on digital technology usage.

ANOVA: To compare the mental health outcomes across different demographic groups.

3.2 RESULTS

A quantitative analysis utilized simple linear regression to examine the relationship between social media engagement and symptoms of anxiety and depression.

Specifically, Pearson's correlation coefficient (r) was used to assess the strength and direction of the relationships between social media engagement and anxiety and depression symptoms. Multivariate linear regression analysis to examine the predictive effect of social media engagement on anxiety and depression symptons, controlling for potential confounding variables (e.g. age, gender, occupation). The results showed a significant association between high social media engagement and increased symptoms of anxiety and depression ($p < 0.05$).

Specific data analysis used for this study includes:

Descriptive Statistics: The average daily screen time was found to be 5.2 hours, with social media usage averaging 2.3 hours per day.

Correlation Analysis: A strong positive correlation ($r = 0.62$) was found between screen time and symptoms of anxiety.

Regression Analysis: Screen time, social media engagement, and work-life balance were significant predictors of mental health outcomes, explaining 45% of the variance in anxiety and depression scores.

ANOVA: Significant differences in mental health outcomes were observed across different age groups, with younger participants reporting higher levels of anxiety and depression.

4.0 DISCUSSION

The findings support prior research indicating the adverse effects of digital overload on mental well-being. High social media engagement correlates with increased anxiety and depression, highlighting the need for digital

detox strategies. The study also underscores the potential benefits of digital technology, such as improved access to mental health resources and enhanced social connections. The findings revealed that digital technology, while offering significant benefits, also poses substantial risks to mental health. The positive aspects include increased access to mental health resources, online support networks, and telehealth services. However, the negative aspects, such as increased anxiety, depression, social isolation, and sleep disruption, highlight the need for balanced digital usage.

5.0 CONCLUSION

In conclusion, this study illuminates the intricate interplay between digital technology and mental health, highlighting both challenges and opportunities for promoting well-being. Digital technologies have the potential to enhance mental health outcomes through increased access to resources and support networks. However, the negative impacts, such as increased anxiety, depression, and social isolation, necessitate targeted interventions. Moving forward, concerted efforts are needed to develop holistic strategies that harness the benefits of digital technologies while safeguarding mental health in an increasingly digitized society.

5.1 RECOMMENDATIONS

1. **Educational Programs:** Implement educational programs that promote digital literacy and emphasize responsible technology use from an early age.
2. **Organizational Guidelines:** Encourage organizations to establish clear guidelines on digital work practices to mitigate stress and support employee well-being.
3. **Interdisciplinary Collaborations:** Foster interdisciplinary collaborations between researchers, policymakers, and technology developers to advance holistic approaches to digital well-being.
4. **Mental Health Support:** Provide accessible mental health support and resources for individuals struggling with digital overload.
5. **Public Awareness Campaigns:** Launch public awareness campaigns to educate people about the potential risks of excessive digital technology use and the importance of maintaining a healthy balance.
6. **Digital Detox Programs:** Encourage the implementation of digital detox programs that allow individuals to take regular breaks from technology to rejuvenate and maintain mental well-being.
7. **Policy Development:** Advocate for policies that regulate digital technology usage, especially among young people, to prevent the negative mental health impacts associated with excessive use.

REFERENCES

Rosen, L. D., Whaling, K., Carrier, L. M., Cheever, N. A., & Rokkum, J. (2023). The Media and Technology Usage and Attitudes Scale: An empirical investigation. Computers in Human Behavior, 29(6), 2501-2511.

Twenge, J. M., Joiner, T. E., Rogers, M. L., & Martin, G. N. (2021). Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. Clinical Psychological Science, 6(1), 3-17.

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N., ... & Ybarra, O. (2022). Facebook use predicts declines in subjective well-being in young adults. PloS One, 8(8), e69841.

Wang, Z., Yang, Y., & Lei, L. (2023). The impact of screen time on adolescent mental health: A meta-analysis. Journal of Adolescence, 92, 36-49.

Smith, A. C., Jones, D. L., & Brown, M. (2023). Telehealth services and mental health during the COVID-19 pandemic: A systematic review. Journal of Medical Internet Research, 25, e24548.

Hale, L., & Guan, S. (2022). Screen time and sleep among school-aged children and adolescents: A systematic literature review. Sleep Medicine Reviews, 21, 50-58.

Robinson, A. M., Turner, J. H., & Jameson, K. R. (2023). Social media use and self-esteem in adolescents: A longitudinal study. Journal of Youth and Adolescence, 52, 234-245.

Lee, S., & Kim, H. (2021). The impact of digital device usage on adolescent mental health. Journal of Adolescence, 89, 123-134.

Jones, T., & Smith, R. (2022). Virtual reality therapy for anxiety disorders: A meta-analysis. Journal of Anxiety Disorders, 75, 102329.

Pew Research Center. (2023). Mobile fact sheet. Retrieved from https://www.pewresearch.org/internet/fact-sheet/mobile/

World Health Organization. (2021). Mental health and psychosocial considerations during the COVID-19 outbreak. Retrieved from https://www.who.int/docs/defaultsource/coronavirus/mental-health-considerations.pdf

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

CHALLENGES TO SDG 8.3: ENHANCING DECENT WORK AND GROWTH FOR NIGERIA'S INFORMAL GRAIN SELLERS

[1]Lawal Gambo Saulawa, [2]Masoud Saidu Garba, [3]Muhammad Bashir Abubakar & [1]Abdullahi Ismail Yakasai
[1]Department of Business Administration, Ahmadu Bello University, Zaria.
[2]Department of Marketing, Ahmadu Bello University, Zaria
[3]Department of Sociology, Ahmadu Bello University, Zaria
lgsaulawa@gmail.com; garbamasoud1234@yahoo.com; mohbash2003@gmail.com; iyakasai@gmail.com

ABSTRACT
Sustainable Development Goal 8.3 (SDG 8.3) aims to promote decent work and economic growth, yet achieving this goal remains challenging for informal workers in Nigeria, particularly grain sellers. This review examines the barriers faced by these workers and their implications for SDG 8.3, through synthesising findings from various sources, including reports from the International Labour Organization (ILO) and the World Bank. Major challenges identified include: lack of legal protection and right; economic instability; and poor working conditions; which were all, compounded by structural inequalities, insufficient government support, and environmental sustainability concerns. The review emphasises the urgent need for policy reforms to strengthen legal frameworks, enhance access to financial services, and promote inclusive policies that address gender and socio-economic disparities. The findings in the paper highlight the critical role of informal workers in Nigeria's economy, while also underscoring that without significant policy interventions, the potential of the informal sector to contribute to economic growth and sustainable development will remain underutilised. The review calls for collaboration among stakeholders—government agencies, civil society organizations, and the private sector—to implement effective strategies that empower informal workers and facilitate their transition to formal employment. Resolving these challenges is essential not only for economic stability, but also for fostering a more inclusive and sustainable economy in Nigeria, thereby advancing progress toward achieving SDG 8.3.

Keywords: *Informal workers, Grain sellers, Nigeria, SDG 8.3, Economic growth, and Decent work*.

1.0 INTRODUCTION

Sustainable Development Goal 8 (SDG 8) aims to promote inclusive and sustainable economic growth, full and productive employment, and decent work for all. This goal is crucial for addressing global challenges such as poverty and inequality, particularly in developing nations. The United Nations emphasises the need for sustained economic growth, targeting a minimum of 7% GDP growth annually in the least developed countries (United Nations, n.d.). Achieving this goal involves implementing policies that foster productive activities, entrepreneurship, and the formalisation of micro, small, and medium-sized enterprises (MSMEs) (Iberdrola, n.d.). However, recent global crises, including the COVID-19 pandemic, have significantly impeded progress, resulting in increased unemployment and economic instability, particularly in low-income regions (United Nations, n.d.).

The importance of decent work among all categories of employees cannot be overemphasised. Decent work therefore is seen as productive work that provides fair income, security in the workplace, and social protection for families, while also offering opportunities for personal development and social integration (United Nations, n.d.). The significance of decent work lies in its ability to eradicate poverty and promote sustainable economic growth (Chigbu & Nekhwevha, 2023). The 'Decent Work Agenda' as contained in SDG 8.3 emphasises employment that is accompanied by rights, representation, and protection, which are interdependent and mutually reinforcing pillars for development (Ergon Associates 2010). According to the International Labour Organization (ILO, n.d.), decent work contributes to social cohesion and drives economic progress by ensuring that individuals can participate meaningfully in the economy (Iberdrola, n.d.). The interdependence of economic growth and decent work is evident, as inclusive economic policies can lead to better job opportunities and improved working conditions, thereby enhancing overall economic productivity (United Nations, n.d.).

In Nigeria, a significant portion of the workforce operates within the informal sector, which includes grain sellers. Informal workers (grain sellers) often lack legal protection, social security, and access to financial services, rendering them particularly vulnerable to economic fluctuations and exploitation (Iberdrola, n.d.). The grain-selling sector is vital for the local economy,

providing livelihoods for many families. However, the challenges faced by these informal workers—such as inadequate access to markets, price volatility, and poor working conditions—these challenges are compounded by structural inequalities, insufficient government support, and environmental sustainability concerns. The absence of robust legal frameworks and targeted policies exacerbates the vulnerabilities of grain sellers, limiting their capacity to transition to formal employment and undermining their contributions to the economy, which ultimately hinder their ability to achieve decent work and economic growth (United Nations, n.d.). Looking deeply at the specific needs of informal workers, including grain sellers, is essential for achieving SDG 8 in Nigeria. This paper highlights the necessity for targeted policies and support mechanisms, underscoring the broader implications for economic resilience and sustainable development among grain sellers in the country.

The main objective of this paper is to identify and analyse the challenges that prevent informal workers, particularly grain sellers, from accessing decent work opportunities and contributing to sustainable economic growth. It will also make an attempt to provide way(s) forward to mitigate the challenges identified.

2.0 METHODOLOGY

Being a review paper, the methodology employed in the paper, is the review of the challenges faced by informal workers, particularly grain sellers in Nigeria. This involves a comprehensive approach to gathering and analyse relevant literature and empirical studies. The following steps outline the methodology used in this review:

Literature Search and Selection: A systematic literature search was conducted to identify relevant studies, reports, and articles focusing on informal workers in Nigeria, specifically grain sellers. The search included academic databases, government reports, and publications from international organisations such as the International Labour Organisation (ILO) and the World Bank. Principal words used in the search included "informal workers," "grain sellers," "Nigeria," "SDG 8.3," "economic growth," and "decent work."

Inclusion and Exclusion Criteria: The selection of literature was guided by specific inclusion and exclusion criteria:

Inclusion Criteria*:* Studies that focused on the informal economy in Nigeria, particularly those addressing the challenges faced by informal workers, economic contributions, their role in attaining SDG goals in Nigeria and policy implications. Peer-reviewed articles, reports from reputable organisations, and empirical research were prioritised.

Exclusion Criteria*:* Studies that did not focus on Nigeria or the informal sector, articles lacking empirical data, and those that were not published in English were (except few), maximally excluded from the review.

Facts Extraction and Analysis: Facts from the selected studies were extracted and organised accordingly to address the main challenges faced by grain sellers. Systematic analysis was employed to identify problematic issues, such as: legal protections and rights, economic instability and access to financial services, gender and socio-economic disparities and environmental sustainability.

Synthesis of Findings: The findings from the literature were synthesised to provide a comprehensive overview of the challenges faced by grain sellers in Nigeria as they relate to SDG 8.3. The synthesis involved comparing and contrasting different studies to highlight commonalities and divergences in findings, particularly concerning the implications for achieving SDG 8.3.

Policy Recommendations: Based on the synthesised findings, policy recommendations were formulated to address the identified challenges. These recommendations were aimed at stakeholders, including government agencies, civil society organizations, and the private sector, to foster an enabling environment for informal workers.

Understanding Informal Work in Nigeria

Informal work, generally, has to do with economic activities that are not fully regulated by the government and lack formal recognition (Chen, 2016). This sector includes small-scale enterprises that operate outside the purview of formal business regulations, often characterised by their unregistered status and lack of social protections for workers (Wiego, n.d.). The term "informal sector" was popularised by Hart (1971) and has since been used to describe a wide range of activities from street vending to small-scale manufacturing (Fasanya & Onakoya, 2012).

Principal Characteristics of Informal Work

Small-scale operations: Informal enterprises typically operate with limited capital and turnover, often family-owned and employing few, if any, paid workers (Yusuf, 2014).

Low education levels: Owners and workers in the informal sector generally have low levels of formal education and training (Folawewo & Orija, 2023), which

can limit their productivity and income potential (Jacobs, 2019).

Ease of entry: The informal sector is characterised by low barriers to entry, allowing individuals to start businesses with minimal resources and regulatory requirements (Fasanya & Onakoya, 2012).

Lack of legal protections: Workers in this sector often do not benefit from the protections afforded to formal sector employees, such as job security, health benefits, and retirement plans (Wiego, n.d.).

Role of Informal Workers in the Nigerian Economy

The informal sector plays a crucial role in the Nigerian economy, contributing significantly to both employment and Gross Domestic Product (GDP). According to estimates, the informal sector accounts for approximately 65% of Nigeria's GDP and employs over half of the workforce, highlighting its importance in providing livelihoods for many Nigerians (Bank of Industry, 2021). Informal workers include street traders, subsistence farmers, and small-scale service providers, who often turn to this sector due to limited opportunities in the formal economy (World Bank, 2021). The informal sector serves as a vital safety net, especially during economic downturns, providing flexible employment options that can adapt to changing economic conditions (Fasanya & Onakoya, 2012).

Despite its contributions, the informal sector faces numerous challenges, including inadequate access to finance, limited infrastructure, and regulatory constraints that hinder growth and productivity (Bank of Industry, 2021). Facing these challenges squarely is essential for enhancing the sector's capacity to contribute to sustainable economic development in Nigeria.

Profile of Grain Sellers and Their Economic Contributions

Grain sellers play a vital role in Nigeria's agricultural landscape, significantly contributing to both local economies and national food security. The agricultural sector accounts for approximately 22.35% of Nigeria's Gross Domestic Product (GDP), with maize alone contributing about 5.88% (Financial Nigeria, 2023). Grain sellers typically operate in informal markets, where they engage in the buying and selling of staple crops such as maize, rice, and cowpea. These sellers often source their products from local farmers or wholesalers and sell them directly to consumers, thereby facilitating access to essential food items (World Grain, 2023).

The economic contributions of grain sellers extend beyond mere sales; they also provide employment opportunities for many individuals, particularly in rural areas. The marketing of grains involves various activities, including transportation, processing, and distribution, which collectively enhance the livelihoods of numerous families (Olayemi, 1998). Furthermore, the grain-selling sector is very important for food security, as it ensures the availability of staple foods to meet the demands of Nigeria's growing population (World Grain, 2023).

Challenges Faced by Informal Workers

Lack of Legal Protection and Rights: this can be categorised into:

Absence of Labour Laws Applicable to Informal Workers: Informal workers often operate outside the scope of formal labour laws, which leaves them without legal protection. The International Labour Organisation (ILO) notes that many informal workers are not recognised as employees under existing labour legislation, which typically applies only to formal employment relationships (ILO, n.d.). This absence of legal recognition results in significant vulnerabilities, as informal workers cannot claim rights or protections that formal workers enjoy, such as the right to fair wages, safe working conditions, and the ability to organize (World Bank, 2021).

Regulatory environment: Grain sellers often operate without formal licenses or permits, exposing them to risks of harassment from authorities and limiting their ability to expand their businesses (Fasanya & Onakoya, 2012).

Vulnerability to Exploitation and Abuse

The lack of legal protections makes informal workers particularly susceptible to exploitation and abuse. Many informal employers disregard labour laws, leading to harsh working conditions and unfair treatment (Tucker & Anantharaman, 2020). Informal workers often fear retaliation for asserting their rights, which can result in job loss or other negative consequences (Bonner & Spooner, 2011). The precarious nature of informal employment further exacerbates this vulnerability, as workers may be too frightened to seek justice when their rights are violated (ILO, n.d.).

Economic Instability: this can also be discerned in the following ways:

Inconsistent Income and Lack of Financial Security: Informal workers frequently face economic instability due to inconsistent income and a lack of financial security. Many operate on a day-to-day basis, earning varying amounts that often do not meet their basic needs (World Bank, 2021). This unpredictability can lead to cycles of poverty, making it challenging for workers to

plan for the future or invest in their businesses (Tucker & Anantharaman, 2020).

Limited Access to Credit and Financial Services: Access to credit and financial services is often limited for informal workers, which further heightens their economic challenges. Without formal employment records or collateral, many informal workers are unable to secure loans or financial assistance, restricting their ability to expand their businesses or cope with emergencies (ILO, n.d.). This lack of access to financial resources can hinder their economic mobility and perpetuate their vulnerable status (World Bank, 2021).

Market dynamics: Grain sellers face challenges such as price volatility and competition from other sellers, which can affect their profit margins and overall income (World Bank, 2021).

Poor Working Conditions: this can also be seen in the following ways:

Health Risks and Safety Concerns: Informal workers frequently endure poor working conditions that pose significant health risks. Many work in environments that lack basic safety measures, exposing them to hazards that can lead to injury or illness (Tucker & Anantharaman, 2020). The absence of regulatory oversight means that informal workplaces often do not comply with health and safety standards, further endangering workers (ILO, n.d.).

Lack of Social Security Benefits: A defining characteristic of informal work is the absence of social security benefits. Informal workers typically do not have access to health insurance, unemployment benefits, or retirement plans, which leaves them vulnerable in times of need (World Bank, 2021). This lack of social safety nets can have devastating effects on workers and their families, particularly during crises such as illness or economic downturns (Tucker & Anantharaman, 2020).

Barriers to Achieving SDG 8.3: this can also be categorised into:

Structural Inequalities in the Labour Market: structural inequalities can be traced through:

Gender Disparities in Access to Decent Work: Gender disparities significantly hinder the achievement of Sustainable Development Goal 8.3, which aims to promote decent work and economic growth. Women often face systemic barriers that limit their access to quality employment opportunities. Despite progress in some areas, women continue to be underrepresented (including grain selling), especially, in higher-paying jobs and leadership positions, leading to persistent income inequalities (Rai, Brown, & Ruwanpura, 2019). The International Labour Organisation (ILO) reports that women are more likely to be employed in informal sectors, where they are subject to lower wages and poorer working conditions (ILO, n.d.). This gender bias in the labour market not only affects women's economic empowerment but also undermines overall economic growth, as it restricts the potential of half the population (World Bank, 2021).

Socio-Economic Factors Affecting Grain Sellers: Socio-economic factors also play a critical role in the barriers faced by informal workers, particularly grain sellers in Nigeria. These workers often operate in a context marked by poverty, limited access to education, and inadequate infrastructure, which collectively impede their ability to achieve decent work (Olayemi, 1998). Grain sellers, who typically lack formal contracts and legal recognition, are vulnerable to market fluctuations and exploitation, which exacerbates their economic instability (World Bank, 2021). The intersection of socio-economic challenges and the informal nature of their work make up a continuous round of impoverishment that is difficult to crack, further complicating efforts to achieve SDG 8.3.

Insufficient Support from Government Policies

Lack of Targeted Programmes for Informal Sector Workers: Government policies often fail to adequately support informal sector workers, which is a significant barrier to achieving SDG 8.3. Many countries including Nigeria are not serious in/or lack targeted programmes designed to address the unique challenges faced by informal workers, such as grain sellers (ILO, n.d.). The absence of such programmes results in a lack of access to essential resources, including training, financial assistance, and legal protections, which are necessary for improving working conditions and economic outcomes (World Bank, 2021). This gap in policy support perpetuates the cycle of informality and economic vulnerability.

Ineffective Implementation of Existing Policies: Even when policies exist, their implementation is often ineffective. The ILO highlights that many countries have established labour laws that are not enforced, particularly in the informal sector (ILO, n.d.). This lack of enforcement undermines the potential benefits of existing policies and fails to protect informal workers from exploitation and poor working conditions. The ineffective implementation of policies contributes to the persistence of informal work and the challenges associated with achieving decent work for all (World Bank, 2021).

Environmental Sustainability Concerns

Impact of Agricultural Practices on the Environment: Environmental sustainability is a critical concern that intersects with economic growth and decent work. Unsustainable agricultural practices, often employed by small holder farmers who often metamorphose into informal grain sellers, can lead to soil degradation, loss of biodiversity, and increased greenhouse gas emissions (Rai et al., 2019). The focus on short-term economic gains often overshadows the need for sustainable practices, (Stoian et al, 2019) which can have detrimental effects on both the environment and the livelihoods of informal workers. Examining these environmental challenges is essential for achieving SDG 8.3, as sustainable agricultural practices can enhance productivity and economic stability for grain sellers.

Need for Integration of Ecological Considerations in E conomic Growth: There is a pressing need to integrate ecological considerations into economic growth strategies to achieve SDG 8.3 effectively (Stoian et al, (2019). The current economic models often prioritise growth over sustainability, leading to practices that are harmful to both the environment and the communities that depend on it (World Bank, 2021). A shift towards sustainable economic practices that consider environmental impacts is necessary to ensure that economic growth does not come at the expense of ecological health. This integration is vital for promoting decent work and economic growth in a manner that is sustainable and equitable.

Policy Recommendations

Strengthening Legal Frameworks for Informal Workers: Strengthening legal frameworks for informal workers is essential for promoting decent work and economic growth. The International Labour Organisation (ILO) emphasises the need to extend labor laws and social protection to informal workers, ensuring that they are recognised and protected under the law (ILO, 2015). This can be achieved by broadening the definition of "employee" in labour legislation to include the diverse nature of informal employment arrangements (Chen, 2016).

Governments should assess existing policies, laws, and regulations to identify gaps that exclude informal workers. Measures must be taken to ensure that informal workers (grain sellers) are aware of their rights and can claim them effectively, such as through legal literacy campaigns and accessible dispute resolution mechanisms (ILO, 2020). Collaboration with workers' organisations and unions can play a major role in strengthening the voice of informal workers in policy dialogues and advocating for legal reforms (ILO, 2020).

Enhancing Access to Financial Services and Credit: Improving informal workers' access to financial services and credit is crucial for promoting economic stability and growth. Flexible payment options, such as tailored contribution rates based on income, can encourage informal workers to participate in social protection programs (Handayani, 2016). Governments should provide incentives and reduce barriers for informal enterprises to register and access formal financial services (ILO, 2020).

Partnerships with microfinance institutions, cooperatives, and community-based organizations can help expand the reach of financial services to informal workers. Innovative approaches, such as mobile banking and digital payment platforms, can also enhance financial inclusion in the informal sector (Handayani, 2016). By improving access to financial resources, informal workers can invest in their businesses, leading to increased productivity and economic stability.

Promoting Inclusive Policies that Address Gender and Socio-Economic Disparities: Inclusive policies that address gender and socio-economic disparities are crucial for achieving decent work and economic growth for all. The ILO emphasises the need to promote the participation and representation of women in workers' organizations, as they make up a significant portion of the informal workforce (ILO, 2020). Policies should also consider the specific challenges faced by informal workers from marginalised socio-economic backgrounds, such as limited access to education and resources.

Governments should adopt a life cycle approach to social protection, ensuring that programs are targeted at different stages of life and can serve as a buffer against shocks for informal workers (Handayani, 2016). Inclusive policies should also prioritise the protection of vulnerable groups, such as migrant workers and refugees, who often face additional barriers in accessing decent work and social protection (ILO, 2020).

Integrating Environmental Sustainability into Economic Policies: Integrating environmental sustainability into economic policies is crucial for promoting long-term, inclusive growth. Unsustainable practices in the informal sector, particularly in agriculture, can have detrimental effects on the environment and undermine the livelihoods of informal workers (World Bank, 2021). Policies should encourage the adoption of sustainable practices and technologies

while providing support and resources to informal workers to facilitate the transition.

Governments should consider the environmental impact of economic activities when designing policies and regulations. This includes promoting green jobs, prioritizing incentives on the use of renewable energy, and investing in sustainable infrastructure (World Bank, 2021). Collaboration with informal workers' organizations can help identify sustainable solutions that align with their needs and priorities.

Call to Action for Stakeholders to Support Informal Workers

Examining the challenges faced by informal workers closely, requires a concerted effort from various stakeholders, including governments, civil society organizations, and the private sector. A call to action is necessary to mobilise resources, implement policies, and create an enabling environment for informal workers to thrive.

Governments must strengthen legal frameworks to recognise and protect the rights of informal workers, ensuring that they have access to social protection and can claim their entitlements effectively. Policies should also aim to enhance access to financial services and credit, enabling informal workers to invest in their businesses and build economic resilience.

Civil society organisations can play a crucial role in advocating for the rights of informal workers, providing them with training and resources, and facilitating the formation of cooperatives. These cooperatives can empower informal workers by enhancing their bargaining power, improving access to markets, and promoting sustainable practices.

The private sector can contribute by partnering with informal workers and supporting their integration into value chains. Corporate social responsibility initiatives can also help improve working conditions and promote sustainable practices in the informal sector.

Importance of Addressing these Challenges for Sustainable Development in Nigeria

Examining and with a view to resolving the challenges faced by informal workers, particularly grain sellers, is essential for achieving sustainable development in Nigeria. Informal workers constitute a significant portion of the workforce and contribute substantially to the economy. By supporting their transition to decent work and economic growth, Nigeria can unlock the potential for inclusive and sustainable development.

Achieving SDG 8.3 has far-reaching implications for other Sustainable Development Goals, such as poverty reduction (SDG 1), food security (SDG 2), and gender equality (SDG 5). Empowering informal workers can lead to improved livelihoods, reduced poverty, and enhanced food security, as grain sellers play a crucial role in ensuring the availability of staple foods.

Moreover, promoting decent work and economic growth in the informal sector can contribute to social cohesion and stability. By attempting to resolving structural inequalities and providing opportunities for marginalised groups, Nigeria can foster a more inclusive society and promote sustainable development.

3.0 CONCLUSION

The review highlights the urgent need to address the challenges faced by informal workers, particularly grain sellers, in Nigeria. By strengthening legal frameworks, enhancing access to financial services, promoting inclusive policies, and integrating environmental sustainability into economic growth strategies, stakeholders can contribute to the achievement of SDG 8.3 and promote sustainable development in Nigeria.

REFERENCES

Akinwale, A., A. (2014). Precarious Working Conditions and Exploitation of Workers in the Nigerian Informal Economy. *Social Science Diliman (10)*1 117-146. https://api-ir.unilag.edu.ng/server/api/core/bitstreams/22fb63a3-cdc1-47a6-90dd-13548d6d51f5/content

Bank of Industry. (2021). Economic development through the Nigerian informal sector: A BOI perspective. Retrieved from https://www.boi.ng/economic-development-through-the-nigerian-informal-sector-a-boi-perspective/

Bonner, C., & Spooner, D. (2011). Organizing in the informal economy: A challenge for trade unions. *International Politics and Society, 2*, 11-22.

Chen, M. A. (2016). The informal economy: Recent trends, future directions. *New Solutions, 26*(2), 155–172. https://doi.org/10.1177/1048291116652613

Chigbu, B. I., & Nekhwevha, F. (2023). Exploring the concepts of decent work through the lens of SDG 8: Addressing challenges and inadequacies. *Frontiers in Sociology, 8, Article* 1266141. https://doi.org/10.3389/fsoc.2023.1266141

Ergon Associates. (2010). Decent work and poverty eradication: Literature review and two-country study. International Trade Union Confederation. https://www.ituc-csi.org/IMG/pdf/Decent-work-and-poverty-eradication-literature-review-and-two-country-study_Full-report.pdf

Fasanya, O. & Onakoya, B. (2012). Informal sector and employment generation in Nigeria. *Research on Humanities and Social Sciences 2*(7), iiste.org

Financial Nigeria. (2023). "Agbado" and the Nigerian economy. Retrieved from https://www.financialnigeria.com/-agbado-and-the-nigerian-economy-blog-800.html

Folawewo, A. O., & Orija, O. A. (2023). Informal–formal workers' transition in Nigeria. In G. S. Fields, T. H. Gindling, K. Sen, M. Danquah, & S. Schotte (Eds.), The job ladder (Chapter 11). Oxford University Press. https://doi.org/10.1093/oso/9780192867339.003.0011

Handayani, S. W. (2016). Designing social protection policy for informal workers. *socialprotection.org.* Retrieved from https://socialprotection.org/discover/blog/designing-social-protection-policy-informal-workers

Iberdrola. (n.d.). SDG 8: Decent work and economic growth. Retrieved from https://www.iberdrola.com/sustainability/committed-sustainable-development-goals/sdg-8-decent-work-and-economic-growth

International Labour Organization (ILO). (n.d.). Informal economy. Retrieved from https://www.ilo.org/projects-and-partnerships/projects/partnership-improving-prospects-forcibly-displaced-persons-and-host/themes/informal-economy

International Labour Organisation. (2020). *Frequently asked questions on social protection for workers in the informal economy*. http://ilo.org

Jacobs, F. (2019). Informal work - Better education and training. D+C Development and Cooperation. https://www.dandc.eu/en/article/more-education-crucial-create-less-informal-and-more-formal-work

OECD. (2024). *Breaking the Vicious Circles of Informal Employment and Low-Paying Work*, OECD Publishing Paris. https://doi.org/10.1787/f95c5a74-en.

Olayemi, J. K. (1998). Marketing of food grains in Nigeria: Problems and prospects. *Journal of Agricultural Economics, 49*(3), 345-354.

Onu, J. I. and H. A. Illiyasu (2008), "An Economic Analysis of the Foodgrains Market in Adamawa State", Nigeria.*World Journal of Agricultural Sciences*, idosi Publications.

Rai, S. M., Brown, B. D., & Ruwanpura, K. N. (2019). SDG 8: Decent work and economic growth – A gendered analysis. *Sustainable Development, 27*(6), 1025-1035. https://doi.org/10.1002/sd.1940

Stoian, D., Monterroso, I. & Current, D. (2019). SDG 8: Decent Work and Economic Growth – Potential Impacts on Forests and Forest-Dependent Livelihoods. *In Sustainable Development Goals: Their Impacts on Forests and People.* Cambridge University Press.

Tucker, J. L. & Anantharaman, M. (2020). Informal work and sustainable cities: from formalisation to Reparation. *One Earth (3)*3 http://doi.org/10.1016/j.oneear.2020.08.012

United Nations. (n.d.). Goal 8 | Department of Economic and Social Affairs. Retrieved from https://sdgs.un.org/goals/goal8

World Bank. (2021). Chapter 2: Characteristics of the informal economy. In Informal economy. Retrieved from https://thedocs.worldbank.org/en/doc/37511318c092e6fd4ca3c60f0af0bea3-0350012021/related/Informal-economy-Chapter-2.pdf

Wiego (n.d.). Informal workers and the law. Retrieved from https://www.wiego.org/informal-workers-and-law

World Grain. (2023). Focus on Nigeria. Retrieved from https://www.world-grain.com/articles/17302-focus-on-nigeria

Yusuf, S. A. (2014). *Informal sector and employment generation in Nigeria* (MPRA Paper No. 55538). Munich Personal RePEc Archive. https://mpra.ub.uni-muenchen.de/55538/

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

GLOCALISE TOOLS: TOWARDS ENSURING SUSTAINABLE EDUCATION AND HUMAN CAPITAL DEVELOPMENT, CLIMATE ACTION, AND GREEN ECONOMY

Adedokun-Shittu N.A., Shittu A. J. K., Shotayo E.O., Adeshina N., Abdul Raheem A.M.O., Abdulazeez M.A., & Taiwo M.A.
adedokun.sna@unilorin.edu.ng

ABSTRACT
The concept of Think Global and Act Local succinctly describes GLOCALISE, and it is the trigger behind developing modern educational tools, using locally available resources which are cost effective, easily accessible and energy-conserving to achieve three sustainable development goals in Nigeria. Depending on the western educational tools to achieve 'equal access to educational opportunities for all' in Nigeria is a bit of a tall order that can take ages to achieve given the level of infrastructural development to facilitate education in the country, electricity and Internet to mention a few. Schools in urban centres struggle to achieve this utopia, while rural schools do not even possess an inkling of their 21st century education needs. In the light of target 10 of the sustainable development goal 4 – Equal access and inclusive quality education for all, GLOCALISE ventured into developing local versions of educational tools and resources that are cost effective, cheap, accessible, easily-made and energy-conserving to provide local alternatives to expensive foreign educational technologies. While also pursuing Education for Sustainable Development (ESD) target of getting every learner climate-ready and National curriculum to become 90% green by 2030, GLOCALISE develops the Reduce-Reuse-Recycle climate action curriculum to equip teachers and students with green skills for green economy

THE LOCAL HOLOGRAM CLASSIFIED AS A GLOCALISE PROJECTOR

Recent cognitive studies provide a new perspective on what it means for learners to use holograms as teaching agents; specifically, they examine how three-dimensional images and systems will become more a part of the way that novices and experts understand and interact with the world of science. Research indicates perceptual effects on student comprehension and other strong educational benefits when instruction is mediated by 3-D imagery in immersed learning settings. Findings show objects that move or undergo perspective transformations are potentially more informative (i.e., convey additional information, such as information for an invariant property) than objects that are stationary (Walker, 2013).

In the perspective of psychology, the ability of children to focus and concentrate effectively is a critical first step and acts as a gateway to thinking toward learning. Many children, especially primary school students, are unable to maintain attention throughout long lessons in the classroom. They easily get distracted by the smallest things, nodding off, sleeping and gazing when they feel the task given is boring. The students' attention span can be improved with the use fascinating teaching and learning tools (Hoon & Shaharuddin, 2019)

The effectiveness of using holograms in teaching and learning has been widely investigated in developed countries. Most studies focused on the use of global holograms, which are pre-recorded and produced by professionals. Local holograms, on the other hand, are created by teachers or students using available tools and resources. The assessment of a local hologram in teaching and learning is not well established, and there is a need to investigate the experts' perceptions before it is fully implemented.

To bridge this identified gap, Adedokun-Shittu, (2022) in their experimental study described how the hologram was developed and assessed (secondary school students' and teachers) users' perception of the developed local hologram. They reported that the local hologram was well developed with room for improvement; Experts' rating of the developed local hologram in teaching and learning were high. They all supported that the materials used are inexpensive; it gives actual representation of the objects, the display functionality depends on the display devices used (Tablet or smartphones), the black background used aid the display of objects over the hologram reflector.

Although holographic technology shows great potential in the society, cost has been identified as one of the main barriers to its use. As such, the development of cost-effective holographic approaches could help to remove the current financial barriers to this novel educational



resource, which led to critical thinking and innovative tool designed and developed by the teachers and the students making use of local materials. The cost of building holograms can vary widely depending on the size, complexity, types of materials used and the intended use. However, with the use of local materials, cost will be reduced, energy will be conserved and green economy will be achieved.

Therefore, the study recommended that the local hologram should be used in all schools to teach abstract and three-dimensional concepts for teaching and learning to be more stimulating and interesting and also stated that Nigerians should stop being consumers of foreign countries expensive teaching and learning tools and look for ways to glocalise their tools (Thinking globally and acting locally). In the same vein they added that the developed local hologram can further be improved for it to be useful in a larger class. This study has significantly contributed to knowledge on the production and use of local or improvised materials for teaching and learning and especially bridged the vacuum of dearth of existing literature on local holograms in education in Nigeria.

GLOCALISE Tools

Advancing from different sets of local hologram try and error, made from plastic bottles, cardboard, carton (Holodu -Adedokun-Shittu, et.al, 2021), weaving cane, and wooden prototypes, is a patented GLOCALISE Projector. Images of some of the prototypes are displayed below:



Holodu, Adedokun-Shittu, et.al, 2021 GLOCALISE projector with display from a tablet PC
Include here the Figure caption and label and refer to it.

The intention behind GLOCALISE tools is designing alternative technologies that can give a close functionality of the modern technologies, yet conserving energy and providing wide and affordable access to the digital technologies, breaking digital divide and creating green economy through intellectual properties developed by teachers, students and vocational workers. The ever-increasing demand for electrical and electronic products for education and other uses and the consequent unsafe disposal poses an existential threat to the planet. It is often said that we stand the chance of losing the society if the environment is destroyed (Mead, 2009). To avoid this disaster, innovative solutions such as development of Glocalise tools which involves the utilisation of non-electric, eco-friendly educational tools come handy (Adedokun-Shittu et al., 2022).

This is with a view to making computing activities as green as possible to reduce the ecological impact on humans and the environment (Sushruta, 2020; Vallabhi, 2021; Showmick et al., 2023). Glocalise tools, constructed with wood and glass/mirror/lens, thus become relevant in the Nigerian context where, apart from the effect of ICT tools on the environment, availability and access also constitute a great barrier to ICT use in education. Therefore, the development of Glocalise tools from locally available and sustainable materials presents an innovative solution to both economic and environmental issues militating against the teaching in Nigeria and Africa at large. This relates to the challenge of inadequacy of ICT tools for instruction and

increased atmospheric carbon dioxide into the already saturated atmosphere, one of the culprits behind climate change and its consequences.

GLOCALISE explores the promotion of a Green environment, computer hygiene and utililization of renewable energy sources through the introduction of Glocalise projectors for teaching sciences in Nigerian senior secondary schools. Glocalise tools are gaining importance in view of the environmental implications of conventional ICT tools (Sushruta, 2020). Conventional projectors consume a substantial amount of electric energy and are thus a concern given the present energy crisis in the country (Ziady, 2021; afDB, 2023; IRENA, 2023). Aside the foregoing, technological devices compound the burden of electronic waste in Nigeria, highlighting the need for sustainable alternative such as the Glocalise projectors.

Unlike the conventional digital devices, Glocalise tools do not use electric energy, built majorly from locally available materials like wood and glass, generally have in common the following high points: As a result of their eco-friendly property, Glocalised projectors do not have the negative effects on human eyes, health and the environment due to radiation emitted into the environment. It is not only environment-friendly, it is also pocket-friendly as it is inexpensive and readily available. Glocalise tools are hardly addictive unlike their digital counter-part. Yet another high point of Glocalise tools is the complex processes involved in the safe disposal of ICT gadgets which are not applicable as they, by virtue of their make (glass and wood) are environment friendly by default. Integrating renewable energy sources into Glocalise projectors is a possibility that is presently being explored. Further research might just be a potent way to raise awareness about renewable energy and sustainable practices among secondary school students while also developing green alternatives for all advanced technological devices for use in education and other sectors. Most assuredly, the issue of computer insecurity or cyber space unhygienicity is minimised since Glocalise tools do not require Internet connection hence students are shielded from this down side.

The lack of waste management system and inadequate education on waste reduction and recycling has prevented Nigeria from harnessing potentials of green economy (UNESCO, 2024a). For Nigeria to turn this waste into wisdom and wealth, it is imperative to tap from Education for Sustainable Development (ESD) with the target of getting every learner climate-ready and National curriculum becoming 90% green by the year 2030. With Nigeria listed among countries to drive the Greening Education Partnership, there is need for a National Curriculum framework to drive climate-friendly action and equip teachers and students with green skills for the transformative quality education and responsible consumption/production and partnership for the goal of green economy.

A major obstacle to Nigeria's efforts in achieving SDGs is a lack of organised approach to combating the *glocal*(global and local) challenges of environmental degradation, poverty, consumerism, dependence on foreign products and unproductive education. These are the wicked problems of the world that GLOCALISE targets by proposing a curriculum framework that incorporates the 3Rs (Reduce, Reuse, Recycle), and encourages teacher/student engagement in sustainability projects aimed at equipping them with green knowledge and skills to turn wastes into wise ventures and wealth creation. GLOCALISE through the production of alternative educational technologies promote outcome-based education, reduce consumerism and dependence on foreign technologies, foster productivity and cultivate environmental-friendly attitudes to address SDGs (4 - Quality education with equal access and inclusivity, SDG 8 – Decent Work and Economic Growth, Industry, Innovation and Infrastructure, 2 – Responsible Consumption and Production, 13 - Climate Action and 17 - Partnership for the goals) with Multiple-Helix stakeholders in Nigerian secondary schools and integrating green curriculum contents into STEM and other related subjects.

GLOCALISE and Sustainable Development Goals

In line with UNESCO's call to providing insights into the current landscape of climate change education: indicating teaching and learning materials used in ASPnet schools at lower secondary education; identifying existing gaps; assessing needs; exploring and developing new materials for climate change integration, GLOCALISE proposes a Curriculum guide for UNESCO on how to integrate climate change into teaching and learning in Nigeria and Africa at large while also achieving human capital development. In line with the UNESCO Greening Education Partnership initiative to promote climate actions, and transformation in educational institutions, GLOCALISE provides real life coaching on responsible contextual climate actions and development of creative climate-friendly inventions following GLOCALISE curriculum being developed for all levels of education (Primary, secondary, Tertiary & vocational) following the 3R principles to achieve the UNESCO target of getting every learner climate-ready and National curriculum becoming 90% green by the year 2030. GLOCALISE develops the Reduce-Reuse-

Recycle climate action curriculum to equip teachers and students with green skills for the transformative quality education and responsible consumption/production and partnership for the goal of green economy.

Reduce: GLOCALISE trains UNESCO ASPNET schools on how to reduce carbon-emission based technologies by improvising modern technology tools with locally-made tools like: GLOCALISE Projector and refrigerator.

Reuse: How to put to good use, some dilapidated buildings, resources, technologies, wastes and byproducts for Green Agriculture purposes, green energy-generation and eco-friendly resources for waste-to-wealth generation by partnering with established Giants like Innov8 hub, Plogging….

Recycle: GLOCALISE trains teachers and students on how to produce instructional resources with recyclable materials like paper, bottles, nylon, … by partnering with local skilled workers, thereby building human capital development.

This experiential learning promotes active engagement and discovery with reflective mental activities by teachers/students' to develop creative thinking using authentic project-based and problem-solving contexts, formulating hypothesis and generating impactful learning outcomes in a collaborative setting with other Multiple-Helix stakeholders (MHS) to solve communal problems (Tibbitts et al., 2023) as entrenched in the SDGs 4, 8, 9, 12, 13 and 17 explored in this study.

CHALLENGES AND WAY FORWARD

Arguably, expecting a comparable level of efficiency from Glocalised projectors as with digital projectors might be a bit of a tall order. Addressing inherent limitations in Glocalise projectors such as brightness and resolution and also enhancing their effectiveness making them more viable alternatives to digital projectors. With adequate investment in research, teacher training and infrastructural development, Glocalise projectors possesses the potential to revolutionise Nigeria's educational landscape. It is capable of addressing multiple challenges faced by the knowledge space as well as promoting a green environment while harnessing the affordances embedded in renewable energy sources. Educators must become familiar with this innovation to ensure its successful implementations in classrooms across the nation, Glocalise materials/tools is capable of moving the Nigerian educational system to an enviable height obtainable in other climes.

Conclusion is missing in the paper.

REFERENCES

Abid, H., Moh'd, J., Moh'd, A. Q., & Rajiv, S. (2022). *Understanding the role of digital technologies in education: A review*. doi:https://doi.org/10.1016/j.susoc.2022.05.004

Adedokun-Shittu, N.A, Mejabi, O.V., Olasehinde-Williams, F.O.A., Yusuf, M.O., AbdulRaheem M.O, Ahmed, M.A., Ajani, A.H. (2023). Contextualising STEM Learning: The GLOCALISE Approach and Web Repository. *West African Journal of Open and Flexible Learning (WAJOFEL).* 12 (1). Https://wajofel.org

afDB. (2023). *Country Focus Report 2022 - Supporting Climate Resilience and a Just Energy Transition in Nigeria*. Retrieved October 12, 2023, from afDB: https://www.afdb.org/en/documents/country-focus-report-2022-supporting-climate-resilience-and-just-energy-transition-nigeria

Anasuya, H., & Narayan, S. (2022). *Elsevier*. doi:https://doi.org/10.1016/j.rser.2021.111754

IRENA. (2023). *Renewable Energy Roadmap: Nigeria*. Retrieved October 12, 2023, from International Renewable Energy Agency: https://www.irena.org/Publications/2023/Jan/Renewable-Energy-Roadmap-Nigeria

Mead, M. (2009). *We won't have a society if we destroy the environment*. Retrieved October 11, 2023, from Nancy Christie: https://www.nancychristie.com/makeachange/2009/05/we-wont-have-a-society-if-we-destroy-the-environment-margaret-mead/

Showmick, G. P., Arpa, S., Mohammad, S. A., Touhid, B., Al Amin, B., & Ahmed, W. R. (2023). A Comprehensive Review of Green Computing: Past, Present, and Future Research. *IEEE, 11*, 87445 - 87494. doi: 10.1109/ACCESS.2023.3304332

Sushruta, M. (2020). *Green Computing: A Step Towards Eco-Friendly Computing*. doi:10.4018/978-1-5225-5793-7.ch006

Tibbitts et al, (2023). s, F., Loni, S., Abrom, A. & Ugarte, G.C., 2023. *From Commitment to Action:*

Integrating Sustainable Development Into National Education Priorities. A Practical Guide for Policymakers, Practitioners and Researchers. New York, Sustainable Development Solutions Network. https://unesdoc.unesco.org/ark:/48223/pf0000191442?posInSet=1&queryId=b3eec378-3d9c-4396-912c-904082a3c2be

UNESCO. 2024. *Greening Curriculum Guidance: Teaching and learning for climate action*. Green Education Partnership. Paris: UNESCO.

Vallabhi, G. (2021). Green Computing: Current Research Trends. *International Journal of Science and Research (IJSR), 10*(7), 544-546. doi:10.21275/MR21709173309

Ziady, H. (2021). *Nigeria is oil rich and energy poor. It can't wait around for cheaper batteries*. Retrieved October 12, 2023, from CNN Business: https://edition.cnn.com/2021/11/03/business/nigeria-clean-energy-transition/index.html

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

THE EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN IMPROVING REPRODUCTIVE EFFICIENCY OF FARM ANIMALS: A REVIEW

Yakub O. Adenuga[1,2] & Kayode I. Adenuga[2,3,4.]
[1]Department of Animal Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria.
[2]Center for Research Innovation Development and Entrepreneurship (CRIDE), United Kingdom.
[3]University of Law Business School, Birmingham, United Kingdom.
[4]Arden University, Birmingham, United Kingdom.
Corresponding Author's Email: yakubadenuga07@gmail.com

ABSTRACT
The integration of artificial intelligence (AI) technology in livestock farming has been identified to significantly improve reproductive efficiency through, improved management practices and advanced reproductive technologies. This transformation cut across various farm animal species and sectors of livestock agriculture. This review aims at synthesizing and analysing existing literatures, on the contributions of AI technology to the improvement of reproductive efficiency of livestock. We explored multiple databases and scientific journals of high repute and rating, using keywords relevant to our findings. This review is a synthesis of over 20 studies in different areas of digital livestock farming, with a special focus on artificial intelligence technologies. The review highlights the significance of the application of various AI technologies *viz.,* machine learning, deep learning, precision learning, robotics and computer vision, in improving the productivity via reproduction of farm animals. These AI tools have been useful on livestock farms for oestrus detection, monitoring fertility rates, embryonic sex determination of animals (e.g. chicks), detection of live embryos in eggs, monitoring heat stress and robotic vaccine and medication administration system. This review reveals the effectiveness of AI tools in addressing various animal welfare concerns, as well as their roles in ensuring that environmental sustainability and public health are not compromised, as mankind strive to meet the ever-increasing demands for animal products, as a result of the exponential increase in human population.

KEYWORDS: *Artificial intelligence, Fertility, Machine learning, Oestrus detection, Precision learning farming, Reproductive efficiency*

1.0 INTRODUCTION

Animal agriculture is experiencing a paradigm shift as a result of the introduction of artificial intelligence (AI). Artificial intelligence technology is used in the data collection and analysis on livestock and poultry farms, to help with decision-making and improve overall farm operations. Factors such as food insecurity, peace, climate change, changes in the production system, and quality assurance have made it imperative on the agricultural sector to adopt more innovative techniques, capable of enhancing production operations (Rojas-Downing *et al.,* 2017). Farmers also have more tasks before them, because the available traditional means of labour is no more sufficient due to increased herd sizes of animals (Aydan, 2019). Moreover, the interest of younger generations is getting drastically reduced day-in-day-out in farming, as a profession. Consequently, farmers are adopting more sophisticated approach to feed the world, in other to prevent global food crisis as the global population rises exponentially (Bouhali *et al.,* 2022; Congdon *et al.,* 2022). Artificial intelligence-based technologies have been applied to a variety of disciplines, including disease management, sustainable resource use, agricultural planning, and animal management (Viego *et al.,* 2022). The agricultural industry has effectively embraced robotics, drones, and intelligent monitoring systems, which continues to exhibit the potential to completely transform farming (Smith, 2006). Artificial intelligence systems are able to monitor and evaluate animal behaviour, health indicators, reproductive and production performance indices, using sensors, internet of things (IoT) devices, and data analytics. Animal welfare, production, and cost-effectiveness are all improved through early disease diagnosis, exact feeding regimens, and efficient resource allocations are made possible by real-time data analysis (Henna *et al.,* 2024). Various AI technologies *viz.,* machine learning, deep learning, precision learning, robotics and computer vision, have gained application in improving the reproductive efficiency of farm animals. These AI tools have been useful on livestock farms for oestrus detection, monitoring fertility rates, embryonic sex determination of animals (e.g. chicks), detection of

mastitis, automated milking, detection of live embryos in eggs, monitoring heat stress and robotic vaccine and medication administration system (Awoke *et al.,* 2024). This review aims at synthesizing and analysing existing literatures, on the contributions of AI technology to the improvement of reproductive efficiency of livestock. The review focuses on the effectiveness of AI tools in improving the reproduction of farm animals, addressing various animal welfare concerns, as well as their roles in ensuring that environmental sustainability and public health are not compromised, as mankind strive to meet the ever-increasing demands for animal products, as a result of the exponential increase in human population.

2.0 MATERIALS AND METHODS

Over 30 articles were pooled from various published and unpublished sources. Relevant keywords and Google Scholar were judiciously deployed throughout the process of putting together this review paper. All articles were summarized without prejudice. All articles that explain the importance of AI in livestock farming and more particularly its application in advancing reproduction of farm animals, are included in the review.

Overview of Artificial Intelligence

Despite been studied for decades, AI remains one of Computer science's most elusive sub-disciplines (Wang *et al.,* 2022). Artificial intelligence is a broad field of computer science that involves the study of creating intelligent machines that can carry out tasks that would typically require human intelligence (Nilsson, 2009). Machines can now mimic and even outperform human intelligence courtesy, AI. Artificial intelligence is simply machine intelligence, as opposed to the intelligence displayed by humans or other animals (Holden, 2012). Artificial intelligence is capable of problem-solving, rational behaviour, and acting like humans. It possesses the extraordinary ability to reason, effectively solve complex problems and acquire new knowledge through learning actions. Rather than setting man into rivalry against machine, AI is fashioned in a synergistic manner of man working together with machine (Holden, 2012). Artificial intelligence carries out actions typically requiring human intelligence, such as speech recognition, visual perception, decision-making, and language translation (Zuraw and Aeffner, 2022). Artificial intelligence is being used to change how farm animals are being managed and monitored, from poultry and dairy cows to pigs (Wang *et al.,* 2022).

Historical Background of Artificial intelligence

Philosophy serves as the basis for artificial intelligence, which was later modelled mathematically. Robots have been discussed throughout history by notable authors like Aristotle (384–322 BC) in his book "Politics," and by intellectuals like Al-Jazari and Leonardo da Vinci in his writings. Artificial intelligence is credited to Alan Mathison Turing, who posed the question "Can machines think?" in 1943 while the world was at war. From being a theory or problem, artificial intelligence has developed to produce different outcomes using mathematical models. It comprises subfields like as machine learning, deep learning, natural language processing, pattern recognition, genetic algorithms, expert systems, speech recognition, robotics, computer vision, and optimization, each focusing on generating solutions for different issues (Dilaver and Dilaver, 2024). The development of syllogism by Aristotle and its use of deductive reasoning marked a significant turning point in humanity's quest to understand its intelligence (Awoke *et al.,* 2024). Notwithstanding its long and deep roots, the history of AI as currently known today is less than a century old. "Computing Machinery and Intelligence" the article of an English mathematician, by name; Alan Turing, which was published in the year 1950 was instrumental in the invention of artificial intelligence (Nilsson, 2009; Tedeschi, 2022). The term "artificial intelligence," was first coined by John McCarthy in 1956 at his first academic conference on the subject (Smith, 2006). However, the investigation into whether or not machines are capable of thought began much earlier. By the middle of the 1960s, major funding for artificial intelligence research was coming from the Defence Department in the United States, and AI labs had been set up all over the globe (McCarthy, 2007). The Lawrence Radiation Laboratory in Livermore also launched its artificial intelligence group at the same time, under the direction of Sidney Fernbach (Shanahan *et al.,* 2022).

Widely Adopted Artificial Intelligence Technologies in Animal Agriculture

Humans have always relied on agriculture and livestock production to provide for their fundamental food needs, using the products of harvested crops and cattle to last generations. The livestock farming industry has also included artificial intelligence in an effort to reduce the possibility of problems stemming from human mistake. It is anticipated to carry out jobs effectively and economically when the circumstances are ideal. Artificial intelligence is applied in several parts of livestock farming, including disease detection, daily routine care, collection of products, improvement of welfare levels, and monitoring of breeding needs.

Artificial intelligence includes methods that have significant importance and impact in many areas, including livestock farming, namely machine learning, deep learning, computer vision, robotics, and natural language processing (Mijwil *et al.,* 2023). Precision livestock farming is another aspect of AI gaining rapid attention in the agriculture industry.

a) Machine learning: An established AI technology is machine learning, which is a collection of methods that let computers carry out a range of cognitive tasks without explicit programming by using examples and data. These complex algorithms use a combination of training on data and practice to mimic human intelligence. To construct relationships between inputs and outputs, instances are used (Mijwil *et al.,* 2023)

b) Deep learning: Deep learning algorithms were inspired by how the human brain works, using an enormous number of neurons linked by a massive number of connections to execute complex activities including speaking, moving, thinking, and seeing (Goodfellow *et al.,* 2016).

c) **Precision livestock farming:** According to Berckmans (2017), Precision livestock farming (PLF) "Management of individual animals by continuous, automated, and real-time monitoring of health, welfare, production/reproduction, and environmental effect" is the definition of precision livestock farming. It is a revolutionary method of animal husbandry that uses technology to improve environmental sustainability, welfare, and productivity. The integration of digital technologies to optimise livestock management is emphasised by Berckmans (2017), in line with recent research on PLF's potential to reduce greenhouse gas emissions and enhance animal welfare. To decrease expenses, contemporary chicken farms try to lower the number of people while maintaining or growing the number of birds. Monitoring animal behaviours, feeding techniques, and environmental conditions are vital to boosting production efficiency and raising animal wellbeing (Patel and Sana, 2022). Furthermore, more efficient management and monitoring techniques are being developed as public interest in and concern over chicken breeding grows. Because there is no direct human-animal contact, Precision Livestock Farming (PLF) instruments allow the unattended collection of broadly understood data on housing conditions and animals in real-time. Data from various sources collected by sensors or other equipment can be used to create an automated management system based on real-time data to regulate animal welfare, health, and performance. The key to making PLF instruments successful is their compatibility with commercial poultry farm equipment, which is determined by the data collected. PLF technologies can help reduce long-term financial losses, enhance and expedite management choices, and detect animal welfare issues promptly enough.

d) **Robotics:** Artificial intelligence applications, image processing systems, and autonomous farm systems are examples of innovations that have decreased human error and improved production speed and quality. Future developments in robotics and artificial intelligence algorithms will make the cattle sector more sustainable. It has been highlighted that robotic systems and artificial intelligence applications, specifically in cattle farming, minimise environmental impacts, improve animal welfare, increase productivity, and increase efficiency while lowering labour costs. It is projected that in the future, with more advanced robotic systems and artificial intelligence algorithms, the sector will become even more sustainable (Dilaver and Dilaver, 2024). Numerous advantages result from the deployment of robotic systems and artificial intelligence applications in the cattle farming sector. They also make it possible to produce better-quality goods and healthier animals. As robotic technologies and artificial intelligence applications continue to proliferate, the cattle farming sector will see substantial changes. Robotic devices are particularly good in milking activities. Automated milking machines provide reliable and sanitary milking procedures while relieving farmers of some of their labour-intensive tasks. These devices have sensors that recognise when cows are around and modify the milking parameters accordingly. Dairy farmers are able to increase milk production and optimise their milking procedures as a result. The management of feeding is a significant additional use of robotic systems in animal production. Robotic feeding systems minimise waste and increase feed efficiency by precisely dispensing feed to animals according to their nutritional requirements. Farmers can ensure that their animals receive the right nutrients while saving time and costs by automating the feeding process. Another important aspect of animal health monitoring is robotic technology. Wearable technology and smart sensors can track vital signs and detect signs of illness such as mastitis (inflammation of the udder) or distress in livestock. Automated veterinary robots can administer treatments or medications as needed, providing timely care to sick or injured animals. In general, livestock industry is expected to benefit from the incorporation of robotic technology into animal

production and management. Farmers can ensure the welfare of their animals while increasing output, efficiency, and sustainability by utilising automation and artificial intelligence.

e) **Computer vision:** One of the most well-known artificial intelligence approaches that advances computer technology is computer vision (Baduge *et al*., 2022). It gathers relevant data from digital photos and video and generates recommendations using that data. This method applies to cameras that are employed in place of the human eye to detect things in photos or videos, make distinctions, and conduct analysis. They are used, for instance, to identify vehicle numbers and differentiate between licence plates and related objects. Additionally, they are used in cattle breeding, agriculture development, and agricultural automation.

f) **Reproductive Efficiency of Farm Animals:** It is a measure of the capacity to reproduce by an adult livestock. Maintenance of optimum reproduction rate is best indicator of overall management of farm. Many physical, physiological, behavioural and disease conditions, likewise stress, lowers the reproductive performance of animals and ultimately herd.

The Contributions of Artificial Intelligence to Some Aspects of Animal Reproduction

Oestrus detection: Dairy production relies heavily on their ability to accurately identify heat (oestrus) (Khatar *et al.,* 2004). Farmers are now able to avert losses due to inaccurate oestrus detection with the aid of advancements in AI technology and its applications (Höglund *et al.,* 2014). Throughout the day, the motion sensor-equipped collar fastened to the neck of the cow pools all kinds of information about the animal (VriesDe *et al.,* 2023). Data is processed by artificial intelligence components of the dairy automation system to reveal information about heat stress, changes in feeding efficiency, and cow oestrus. Specific hormones influencing the cow's behaviour and movement are released when the oestrus cycle begins (Abeygunawardena and Dematawewa, 2004). A cow in standing heat, for instance, would stop moving for a prolonged period for others to mount her (Yusuf *et al.,* 2010). The AI component can predict the cow's ovulation period by comparing recently collected motion data with previously stored data (VriesDe *et al.,* 2023). The ovulation period usually commences 24 to 32 hours after the onset of oestrus.

Monitoring fertility and prediction of breeding cycles: To optimize breeding programs, livestock producers can also use predictive analytics. The artificial intelligence system can track the female animals' cycles and when they go into heat, recommending the ideal time for insemination. What is crucial is that different environmental factors affect the likelihood of fertilization. Synchronizing all these data, the system suggests the ideal times for breeding (Morota *et al.,* 2018).

Embryonic sex determination: Using artificial intelligence to determine sex could end the contentious practice of killing male chicks on farms (Samad *et al.,* 2022). The livestock producers can switch to a more morally and ethically sound, yet also more successful approach, by determining the sex during the first few days of incubation. Magnetic resonance imaging (MRI) and artificial intelligence models that assess and categorize the images can actualize that (Zuraw and Aeffner, 2022).

Determination of live embryo in eggs: Early detection of non-hatchable and unfertile eggs protects farmers from expending unnecessary production costs, while maximizing hatchery space use and raising productivity (Rotaru *et al.,* 2021). This can be achieved by combining near-infrared hyperspectral imaging methods with machine learning (Zuraw and Aeffner, 2022). To quickly remove the unfertile eggs from the hatchery, farmers train machine learning algorithms with datasets containing images of fertile and unfertile eggs. Computer vision can be used to monitor the development of embryos as well as identify fertile eggs (Tedeschi, 2022). The machine learning model, which was trained using images that show the proper embryo development, is capable of spotting anomalies at each stage and notifying the hatchery managers so they can prevent waste and keep productivity as high as possible (Morota *et al.,* 2018). Moreover, if such a system is coupled with sensors, it gives them perceptions of the influence of the circumstances on embryo development (Viejo *et al.,* 2022)

Monitoring heat stress through temperature analysis: Monitoring heat stress is another way artificial intelligence can enhance animal welfare (Ezanno *et al.,* 2021) Farm animals are frequently subjected to high temperatures due to the high stocking density of animals in a relatively small area, which frequently has a detrimental impact on both their physical and mental health (Neetson *et al.,* 2008). To detect heat stress early and determine health status, a livestock management system and camera technology are used (Endale, 20006). The sensors built into the AI-based system can gather data on temperature, extract insights about its rises and falls, and link it to specific actions or behaviours (Rotaru *et al.,* 2021). The machine learning model recognizes

patterns that increase the risk of heat exhaustion and sends a real-time alert when the temperature reaches the level that has been designated as dangerous (Kumari and Dhawal, 2021). The farmers can introduce improvements in this area by using the data they have collected (Wang *et al.,* 2022).

Robotic vaccination and medication administration system: Today, dairy farm animals must receive hundreds of vaccinations and reproductive medications from farmers (Courtin *et al.,* 2008). Each dairy farm would need to invest significantly in labour and training if it intended to administer vaccines manually (Flint and Wooliam, 2008). Modern dairy farms administer vaccines and reproductive drugs to domestic animals on the dairy farm using a robotic injection system to ensure a sustainable economic future for dairy farms and to achieve a 100 percent compliance rate (Ezanno *et al.,* 2021). With a dairy automation system, the robotic system is integrated (Kumari and Dhawal, 2021). The robotic injection system reads the tags that are attached to the cow's ear to obtain data on the cow's health and vaccination history (Morota *et al.,* 2018) If the cow needs an injection, the needle is pointed in that direction, and the injection mechanism positions itself to deliver the medication to the cow's neck (Neethirajan, 2022).

Merits and Demerits of Artificial Intelligence

Generally, AI is a blessing for boosting efficiency and productivity while also lowering the possibility of human error (Isabelle and Westerlund, 2022). Artificial intelligence promises precision in livestock farming, but if farmers are unable to understand the data and put it to use, the information is useless (Ezanno *et al.,* 2021). Producers can use artificial intelligence to simulate human decision-making to provide interpretations and solutions for the data gathered by sensors and other hardware technologies (Zuraw and Aeffner, 2022). A few drawbacks exist as well, such as the expense of development and the potential for automation to replace them (Isabelle and Westerlund, 2022). Therefore, unemployment, the high cost of technology such as drones, which can be expensive to build, rebuild, and repair, and the large amount of data needed to train AI are all issues (Kumari and Dhawal, 2021). Additionally, hackers can use AI solutions to gather private information (Congdon *et al.,* 2022).

Potential Applicability of Artificial Intelligence in Animal Agriculture

This review reveals that AI technology has gained wide application in some sectors of livestock farming, especially dairy and poultry, leaving behind diverse species of farm animals which are yet to fully integrated into the AI technology. It is also worthy of note that, aside what has already been documented, AI technologies are very applicable to some other aspects of animal agriculture. For instance, the roles of AI technologies in advancing reproductive technologies such as pregnancy testing, prediction of onset of parturition using endocrine cues, oestrus synchronization, cryopreservation of genetic resources, among others deserve to be investigated

3.0 CONCLUSION

Artificial intelligence has also entered the livestock farming sector with the aim of minimizing potential issues resulting from human error. It is expected to efficiently perform tasks with minimal costs under optimal conditions. Artificial intelligence is utilized in various aspects of livestock farming, including disease diagnosis, daily routine care, collection of products, improvement of welfare levels, and monitoring of breeding needs. Considering the importance of animal reproduction and reproductive efficiency to livestock production, more research efforts should be exerted towards unravelling the potential areas of application of AI technology, with the aim of advancing the reproductive performance of farm animals.

REFERENCES

Abeygunawardena, H., & Dematawewa, C. M. B. (2004). Pre-pubertal and postpartum anestrus in tropical Zebu cattle. *Animal Reproduction Science*, *82*, 373-387.

Aydan, A. (2019). Impact of artificial intelligence on agricultural, healthcare and logistics industries. *Annals of Spiru Haret University. Economic Series*, *19*(2), 167-175.

Baduge, S. K., Thilakarathna, S., Perera, J. S., Arashpour, M., Sharafi, P., Teodosio, B., ... & Mendis, P. (2022). Artificial intelligence and smart vision for building and construction 4.0: Machine and deep learning methods and applications. *Automation in Construction*, *141*, 104440.

Berckmans, D. (2017). General introduction to precision livestock farming. *Animal Frontiers*, *7*(1), 6-11.

Bouhali, O., Bensmail, H., Sheharyar, A., David, F., & Johnson, J. P. (2022). A review of radiomics and artificial intelligence and their application in veterinary diagnostic imaging. *Veterinary Sciences*, *9*(11), 620.

Congdon, J. V., Hosseini, M., Gading, E. F., Masousi, M., Franke, M., & MacDonald, S. E. (2022). The future of artificial intelligence in monitoring

animal identification, health, and behaviour. *Animals*, *12*(13), 1711.

Courtin, D., Berthier, D., Thevenon, S., Dayo, G. K., Garcia, A., & Bucheton, B. (2008). Host genetics in African trypanosomiasis. *Infection, Genetics and Evolution*, *8*(3), 229-238.

De Vries, A., Bliznyuk, N., & Pinedo, P. (2023). Invited Review: Examples and opportunities for artificial intelligence (AI) in dairy farms. *Applied Animal Science*, *39*(1), 14-22.

Dilaver, H., & Dilaver, K. F. (2024). Robotics Systems and Artificial Intelligence Applications in Livestock Farming. *Journal of Animal Science and Economics*, *3*(2), 63-72.

Ezanno, P., Picault, S., Beaunée, G., Bailly, X., Muñoz, F., Duboz, R., ... & Guégan, J. F. (2021). Research perspectives on animal health in the era of artificial intelligence. *Veterinary research*, *52*, 1-15.

Flint, A. P. F., & Woolliams, J. A. (2008). Precision animal breeding. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1491), 573-590.

Fuentes, S., Viejo, C. G., Tongson, E., & Dunshea, F. R. (2022). The livestock farming digital transformation: implementation of new and emerging technologies using artificial intelligence. *Animal Health Research Reviews*, *23*(1), 59-71.

Goodfellow, I. (2016). Deep learning.

Henna, Hamadani., Ambreen, Hamadani., Shabia, Shabir. (2024). Artificial intelligence in animal farms for management and breeding. 167-182. doi: 10.1016/b978-0-443-24001-0.00011-7

Isabelle, D. A., & Westerlund, M. (2022). A review and categorization of artificial intelligence-based opportunities in wildlife, ocean and land conservation. *Sustainability*, *14*(4), 1979.

Khatkar, M. S., Thomson, P. C., Tammen, I., & Raadsma, H. W. (2004). Quantitative trait loci mapping in dairy cattle: review and meta-analysis. *Genetics selection evolution*, *36*(2), 163-190.

Kumari, M., & Dhawal, K. (2021). Application of artificial intelligence (AI) in animal husbandry. *Vigyan Varta*, *2*(2), 27-29.

Laca, E. A. (2009). Precision livestock production: tools and concepts. *Revista brasileira de zootecnia*, *38*, 123-132.

McCarthy, J. (2007). What is artificial intelligence.

Melak, A., Aseged, T., & Shitaw, T. (2024). The Influence of Artificial Intelligence Technology on the Management of Livestock Farms. *International Journal of Distributed Sensor Networks*, *2024*(1), 8929748.

Mijwil, M. M., Adelaja, O., Badr, A., Ali, G., Buruga, B. A., & Pudasaini, P. (2023). Innovative livestock: A survey of artificial intelligence techniques in livestock farming management. *Wasit Journal of Computer and Mathematics Science*, *2*(4), 99-106.

Morota, G., Ventura, R. V., Silva, F. F., Koyama, M., & Fernando, S. C. (2018). Big data analytics and precision animal agriculture symposium: Machine learning and data mining advance predictive big data analysis in precision animal agriculture. *Journal of animal science*, *96*(4), 1540-1550.

Neethirajan, S. (2022). Affective state recognition in livestock—artificial intelligence approaches. *Animals*, *12*(6), 759.

Nilsson, N. J. (2009). *The quest for artificial intelligence*. Cambridge University Press.

Oliveira, D. A. B., Pereira, L. G. R., Bresolin, T., Ferreira, R. E. P., & Dorea, J. R. R. (2021). A review of deep learning algorithms for computer vision systems in livestock. *Livestock Science*, *253*, 104700.

Patel, H., & Sana, A. (2022). Role of Computer Science (Artificial Intelligence) In Poultry Management. *Devotion: Journal of Research and Community Service*, *3*(12), 2068-2088.

Patel, H., Samad, A., Hamza, M., Muazzam, A., & Harahap, M. K. (2022). Role of artificial intelligence in livestock and poultry farming. *Sinkron: jurnal dan penelitian teknik informatika*, *6*(4), 2425-2429.

Rojas-Downing, M. M., Nejadhashemi, A. P., Harrigan, T., & Woznicki, S. A. (2017). Climate change and livestock: Impacts, adaptation, and mitigation. *Climate risk management*, *16*, 145-163.

Rotaru, A., Vâtcă, A., Pop, I., & Andronie, L. (2021). Artificial intelligence, a possible solution for agriculture and animal husbandry sector. *Bulletin of the University of Agricultural Sciences & Veterinary Medicine Cluj-Napoca. Animal Science & Biotechnologies*, *78*(2).

Shanahan, M., Crosby, M., Beyret, B., & Cheke, L. (2020). Artificial intelligence and the common sense of animals. *Trends in Cognitive Sciences*, *24*(11), 862-872.

Smith, C., McGuire, B., Huang, T., & Yang, G. (2006). The history of artificial intelligence. University of Washington. *Retrieved June*, *8*, 2017.

Tedeschi, L. O. (2022). ASAS-NANP Symposium: Mathematical Modeling in Animal Nutrition: The progression of data analytics and artificial intelligence in support of sustainable

development in animal science. *Journal of Animal Science*, *100*(6), skac111.

Wang, S., Jiang, H., Qiao, Y., Jiang, S., Lin, H., & Sun, Q. (2022). The research progress of vision-based artificial intelligence in smart pig farming. *Sensors*, *22*(17), 6541.

Yusuf, M., Nakao, T., Ranasinghe, R. B. K., Gautam, G., Long, S. T., Yoshida, C., ... & Hayashi, A. (2010). Reproductive performance of repeat breeders in dairy herds. *Theriogenology*, *73*(9), 1220-1229.

Zuraw, A., & Aeffner, F. (2022). Whole-slide imaging, tissue image analysis, and artificial intelligence in veterinary pathology: An updated introduction and review. *Veterinary Pathology*, *59*(1), 6-25.

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

DIGITAL TECHNOLOGY ADOPTION AND INNOVATION PERFORMANCE OF THE TRANSPORTATION SECTOR IN NIGERIA

Olushola E, Omoniyi [1], Silas Ndace [2], Ruth Fatima Kolo[3] & Comfort Bolaji Adeniyi[4]
[1,2,3]Department of Entrepreneurship Studies
Federal University of Technology Minna. Niger State Nigeria
[1]Sholomvision2@gmail.com*, [2]silwanciko@gmail.com, [3]yisaruth10@yahoo.com
[4]Department of Entrepreneurship Studies
Bamidele Olumilua University of Education, Science and Technology,
Ikere, Ekiti State. Nigeria
Adeniyi.bolaji@gmail.com

ABSTRACT
The transportation sector in Nigeria faces persistent challenges, including inefficiencies, poor infrastructure, and outdated systems, which limit its ability to meet growing demand. Despite the potential of digital technologies to enhance operational efficiency, innovation, and service delivery, their adoption within the sector remains low. This study examines the impact of digital technology adoption on the innovation performance of firms, focusing on three key variables: technological infrastructure, organizational readiness, and regulatory support. Primary data was collected from 491 enterprises in the transportation sector and the data were analysed using a regression analysis model. The study reveals a statistically significant but modest positive relationship between these variables and innovation performance, with an R value of 0.117 and an R-squared value of 0.013, indicating that the model explains only 1.3% of the variance in innovation performance. Technological infrastructure showed a significant positive impact, suggesting that access to advanced technologies is critical for fostering innovation. Organizational readiness also demonstrated a statistically significant positive effect, highlighting the importance of leadership commitment, employee skills, and alignment with innovation goals in driving successful digital adoption. While regulatory support showed a positive influence on innovation performance, its impact was only marginally significant, suggesting that while conducive regulatory environments are important, other factors may moderate their effectiveness. The study underscores the need for firms to invest in technological capabilities and organizational preparedness to enhance their innovative potential.

Keywords: *Digital Technology Adoption, Innovation Performance, Organizational Readiness, Regulatory Support, Technological Infrastructure*

1.0 INTRODUCTION

The transportation sector is crucial for economic development, serving as a backbone for trade and facilitating the movement of goods and people. In Nigeria, this sector plays a vital role in connecting various parts of the country and boosting economic activities. However, it faces challenges such as inadequate infrastructure, inefficiency, and poor service delivery, which hinder its optimal performance. The adoption of digital technologies, including information and communication technologies (ICT), Internet of Things (IoT), artificial intelligence (AI), and big data analytics, has been recognized as a potential solution to these issues (Plewa et al., 2012). These technologies can enhance operational efficiency, reduce costs, improve safety, and provide better customer experiences. Recent studies have emphasized that the integration of digital technologies is not just a facilitator but a critical driver of innovation performance in the transportation sector (Carlan et al., 2017).

Digital technology adoption in the transportation sector encompasses the use of advanced tools and platforms to streamline operations, optimize routes, and manage logistics efficiently. The integration of digital technologies offers significant opportunities to improve transport efficiency, infrastructure development, energy requirements, and policy frameworks (Noussan and Tagliapietra, 2020; Inac and Oztemel, 2021). Through the use of digital platforms, real-time data collection, and advanced analytics, transportation organizations can optimize their operations by minimizing congestion, reducing travel times, and optimizing routes (Zhu et al., 2019). Intelligent transportation systems powered by digital technologies can enable better traffic management, leading to smoother traffic flow and reduced emissions (Lv and Shang, 2023). Additionally, digital transformation can facilitate the integration of renewable energy sources into transportation networks,

supporting the transition to a low-carbon future (Cho et al., 2019).

Three essential variables used to measure digital technology adoption: technological infrastructure, organizational readiness, and regulatory support. Technological infrastructure refers to the availability of hardware, software, and network capabilities that enable the deployment of digital solutions. In the Nigerian transportation sector, the state of technological infrastructure varies, with some regions experiencing better connectivity and access to advanced technologies than others. This disparity affects the uniformity of digital technology adoption across the country (Engholm et al., 2020). Organizational readiness pertains to the willingness and capability of transport companies to embrace digital transformation. This includes factors such as leadership commitment, employee skills, and financial resources. Organizations that are prepared to invest in training and development, change management, and strategic alignment with digital initiatives are more likely to succeed in adopting new technologies (Lammers et al., 2019). Lastly, regulatory support is a critical variable, as the government's role in creating a favorable environment through policies, incentives, and infrastructure development cannot be overstated. The absence of supportive regulations or the presence of restrictive policies can significantly hinder digital adoption efforts (Carlan et al., 2017). Theoretically, the Technology-Organization-Environment (TOE) framework provides a robust foundation for understanding the factors that influence the adoption of digital technologies in organizations. This model considers technological readiness, organizational context, and environmental factors as key determinants of technology adoption (Almehairbi, et al., (2022). In Nigeria's transportation sector, technological readiness involves the availability and affordability of technology, while the organizational context includes the internal processes, culture, and structure that support technology implementation. Environmental factors involve regulatory frameworks, market dynamics, and the competitive pressure to innovate (Bechtsis et al., 2018; Blichfeldt and Faullant 2021).

Innovation performance, defined as the ability of organizations to develop new products, services, or processes that improve efficiency and competitiveness, is directly impacted by the level of digital technology adoption. The integration of digital technologies allows for real-time data analytics, which can optimize fleet management, predict maintenance needs, and enhance customer service. These improvements contribute to overall operational efficiency and service delivery, which are critical components of innovation performance in the transportation sector (Engholm et al., 2020). Moreover, digital technology adoption facilitates better decision-making processes through the availability of accurate and timely information, thus enabling organizations to respond swiftly to market changes and customer demands (Matthess et al, 2023).

One of the key benefits of digital transformation in transportation is the greater transparency and accountability it brings to the system (Ghobakhloo & Ching, 2019). Digitizing processes such as ticketing, booking, and payment systems enables stakeholders to access real-time information, empowering them to make informed decisions (Elia et al, 2020). This transparency fosters trust among users and promotes accountability among transportation service providers. Moreover, digital platforms can facilitate the tracking and monitoring of transportation operations, ensuring compliance with sustainability standards and regulations (Matthess et al., 2023). This increased transparency and accountability contribute to a more sustainable and reliable transportation ecosystem. The adoption of digital technologies in Nigeria's transportation sector is essential for addressing current operational challenges and enhancing innovation performance. By leveraging technological infrastructure, ensuring organizational readiness, and obtaining regulatory support, the sector can achieve significant improvements in service delivery and efficiency.

The main objective of this study is to examine the impact of digital technology adoption on the innovation performance of the transportation sector in Nigeria. The specific objectives are to:

i. To examine the impact of technological infrastructure on the innovation performance of transportation sector in Nigeria

ii. To evaluate how organizational readiness affects the innovation performance of transportation sector in Nigeria.

iii. To evaluate the impact of regulatory support on innovation performance of transportation sector in Nigeria.

In line with this, the following hypotheses were tested:

HO_1: Technological infrastructure has no significant impact on the innovation performance of transportation sector in Nigeria

HO_2: Organizational readiness has no significant impact on the innovation performance of transportation sector in Nigeria

HO_3: Regulatory support has no significant impact on the innovation performance of transportation sector in Nigeria

This study focuses on assessing the impact of digital technology adoption on the innovation performance of transportation sector in Nigeria. Specifically, it will examine how technological infrastructure, organizational readiness and regulatory support influences key performance indicators such as innovation, efficiency, scalability, and market competitiveness of transportation sector in Nigeria.

2.0 RELATED WORK

Innovation Performance

Pinho (2008) defined innovation performance as a process of improvement in Human Resource (HR) practices, processes, and procedures and it provides an aid to enhance the legacy of performance, implication, and worth of the administration, services, and operational processes. Innovation performance is taken as an important indicator of organizational effectiveness in semi-government organizations more specifically in IT firms, as IT firms need to be involved in the continuous process of innovating new products, ideas, services, and processes (Bustinza et al., 2019). Rajapathirana and Hui (2018) defined innovation performance as firm's ability to develop innovative products, the speed of the development process, and the ability to introduce the product to the market on time. According to Lafuente et al., (2019) innovation performance, a longer-term measure, is about a firm's capability to improve the significance, usefulness and performance of its products and services. It is hard for competitors to imitate if some innovation technology internalized by a firm is valuable and unique and contributes vitally to sustain the competitive advantage of an organization. Innovation performance is traditionally divided into product innovation and process innovation (Azar & Ciabuschi, 2017). Hong et al., (2019) introduce a new dimension called management innovation to measure innovation performance in a more comprehensive way. In other words, they suggest that innovation performance be measured by three variables: product innovation, process innovation, and management innovation.

Digital Technology Adoption

A unified definition of "Digital Technology Adoption" is yet to be established. In 2019, Vial analyzed 282 academic papers on digital technology and found 23 different interpretations. He developed a theoretical explanation of utilizing digital technology as "a process aimed at improving an entity by making significant changes to its features by incorporating information, computing, communication, and connectivity technologies". Shahadat et al. (2023) claim that the uptake of digital technology arises from digitalization and relates to how the integration of digital technologies could create new, disruptive business and value-producing models. Usai et al. (2021) describe it as the utilization, relocation, or improvement of current technologies to improve efficiency and benefit customers and organizations, whereas Ladu et al. (2024) stress that these technologies do not have to be new; the novelty is determined by the business and value creation models. According to Riedl et al. (2017), digitalization is the use of digital technology. This entails incorporating digital technology in business operations, products, and resources to enhance customer benefits, discover fresh revenue opportunities, increase productivity, and reduce risks in the company (Nikou et al., 2022). Simply transitioning services to digital technology alone does not bring about significant changes within an organization; rather, a harmonious blend of technology, staff, and procedural changes is often required. Ofosu-Ampong and colleagues (2023) stress the significance of having a digital transformation strategy in order to effectively guide this process of change.

Digital Technology Adoption and Innovation Performance

The empirical evidence from the reviewed articles highlights the importance of technological infrastructure, organizational readiness, and regulatory support in driving digital technology adoption and innovation performance in the transportation sector Almehairbi, et al., (2022) and Li et al., (2022) highlight the critical role of infrastructure and readiness, suggesting that companies must invest in these areas to achieve high innovation performance. Shen et al. (2022) and Zhoua et al. (2022) reported the foundational role of technological infrastructure, without which other efforts to adopt digital technologies may be futile. However, the findings also point out the disparities in technological infrastructure across different regions, which could create inequality in innovation capabilities. Similarly, the emphasis on organizational readiness highlights the need for a cultural shift towards embracing digital transformation, which requires strong leadership and strategic alignment with business goals. The studies by Blichfeldt and Faullant (2021) and Zhou, et al., (2023) stress the role of regulatory support in fostering a conducive environment for digital adoption. They argue that favorable policies, incentives, and a stable regulatory

framework are essential for encouraging investments in digital technologies. Almehairbi, et al., (2022) and Zhou, et al., (2023) argued out the importance of organizational readiness, suggesting that even with adequate technological infrastructure, the success of digital adoption largely depends on internal factors such as leadership, skills, and culture. However, the critique from Shen et al., (2022) points out the challenges related to regulatory inefficiencies and resistance to change, indicating that while regulations are necessary, they must be streamlined and effectively implemented to avoid hindering innovation efforts. Overall, these studies provide valuable insights into the factors that influence digital technology adoption and its impact on innovation performance. They collectively emphasize the need for a holistic approach that addresses technological, organizational, and regulatory dimensions to successfully drive digital transformation in the transportation sector.

THEORETICAL FRAMEWORK

The Technology-Organization-Environment (TOE) framework, proposed by Tornatzky and Fleischer (Arpaci et al., 2012), provides a comprehensive model for understanding the digital adoption within the transportation sector. The framework posits those three key elements—technology, organization, and environment—interact to influence the adoption and implementation of new technologies. The TOE framework assumes that organizational decisions regarding technology adoption are influenced by internal and external factors (Baker 2012). The organizational dimension considers factors like firm size, resources, and managerial support, while the environmental dimension includes external pressures, such as competition and regulatory influences (Badghish & Soomro, 2024). One criticism of the TOE framework is that it may oversimplify the complex and dynamic nature of technology adoption by categorizing influencing factors into broad categories (Nguyen et al., 2022; Amini & Jahanbakhsh, 2023). Additionally, it is sometimes criticized for lacking specificity in how these factors interact or for not sufficiently considering the role of human agency and individual decision-making processes. The TOE framework is particularly applicable to this study for it allows for a complex analysis of how digital technology adoption enhances innovation performance. Researchers using the TOE framework have identified perceived benefits as one of the key factors that aid digital technologies adoption. For example, Chittipaka et al. (2023), after using the TOE framework to study blockchain technology adoption by firms, identified the perceived advantage of the new systems over their predecessors as one of the technological factors that influence adoption. Lin and Chen (2023) used TOE for understanding the risk factors in sustainable water resources management, while Sabbah et al. (2019) applied the framework to evaluate AI the use and challenges of cloud computing services in SMEs in Nigeria. These studies demonstrate the relevance and adaptability of the TOE framework to emerging economies and technological innovations, reinforcing its applicability to the examination of technology adoption and innovation performance

3.0 METHODOLOGY

A survey design was employed to attain the objectives of this study. The population consisted of 3,453 transport business enterprise registered with Small and Medium Enterprises Development Agency of Nigeria (SMEDAN 2017). Using Taro Yamane's formula for sample size determination, a sample size of 278 employees was derived. Using Yamane's formula, a sample size of three hundred and seventy-nine (379) was obtained at a 95 percent confidence level and a 5 percent error of precision level (1967). A random sampling technique ensured a representative sample from various departments and hierarchical levels within the transport sector. Primary data collected through online questionnaires were analyzed. Descriptive statistics, such as mean and standard deviation, were used alongside regression analysis to test hypotheses. The Statistical Package for Social Sciences (SPSS) version 17.0 facilitated data analysis, ensuring robust results aligned with the study's objectives.

The model is represented by:

$$IP_{it} = \beta_0 + \beta_1 TI_{it} + \beta_2 OR_{it} + \beta_3 RS_{it} + \mu_{it}$$

Where:

IP = Innovation Performance

TI = technological infrastructure

OR = organizational readiness

RS = regulatory support

β_0 = Intercept

β_{1-3} = Regression Coefficients

μ = The error term.

The data obtained are analysed with regression statistics using SPSS 5% level of significance, if the estimated t-value is equal or greater > than table (critical) t-value, we reject Null and accept alternate hypothesis

4.0 RESULT AND DISCUSSION

This section presents the data obtained from the field. The researcher administered 529 questionnaires; and 491 were filled and returned, giving a response rate of 94.4 %. Table 1 summarizes the findings from the variable correlation analyses to determine whether there is a bivariate relationship between each pair of dependent and independent variables and to ensure that the correlations between the explanatory variables are not so strong as to produce multicollinearity issues.

Table 1: Correlation coefficient

		TI	OR	RS	IP
TI	Pearson Correlation	1	.430**	.333**	.425**
	Sig. (2-tailed)		.000	.000	.000
	N		491	491	491
OR	Pearson Correlation		1	.642**	.462**
	Sig. (2-tailed)			.000	.000
	N			491	491
RS	Pearson Correlation			1	.504**
	Sig. (2-tailed)				.000
	N				491
IP	Pearson Correlation				1
	Sig. (2-tailed)				
	N				

Correlation is significant at the 0.01 level (2-tailed).

The model summary in Table 2 reveals an R-value of 0.117, indicating a weak positive correlation between the independent variables (TI, OR, RS) and the dependent variable (IP). While this correlation is not strong, it does show some degree of relationship.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.117[a]	.013	.010	.50506	1. 950

a. Dependent Variable: IP

The R-squared value is 0.013, suggesting that only 1.3% of the variability in innovation performance can be explained by the combined influence of technological infrastructure, organizational readiness, and regulatory support. The adjusted R-squared value is 0.010, slightly lower than the R-squared, which accounts for the number of predictors in the model. The minimal difference between R-squared and adjusted R-squared indicates that adding more predictors would not significantly change the explained variance in innovation performance. Despite this, the low R-squared values suggest that other factors not included in this model likely play a more significant role in determining innovation performance.

The standard error of the estimate is 0.50506, which indicates the average distance that the observed values fall from the regression line. A standard error of this magnitude reflects a moderate level of dispersion in the model's predicted versus observed innovation performance values. The Durbin-Watson statistic is 1.950, which is close to the ideal value of 2. This suggests that there is no significant autocorrelation in the residuals, implying that the model's predictions are independent and not affected by previous values.

Table 3 provides a test of the overall significance of the regression model.

Table 3: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.075	2	1.037	3.679	.023[b]
	Residual	137.644	488	.303		
	Total	139.719	490			

a. Dependent Variable: IP

The regression sum of squares is 2.075, with a mean square of 1.037. The residual sum of squares, representing the unexplained variation by the model, is significantly higher at 137.644. The F-statistic value stands at 3.679 with a significance level (p-value) of 0.023. This p-value is less than 0.05, indicating that the model is statistically significant at the 95% confidence level. Thus, there is evidence to reject the null hypothesis, which posits that there is no relationship between the independent variables and innovation performance. The significant F-statistic shows that the overall model does have explanatory power, and the combination of technological infrastructure, organizational readiness, and regulatory support collectively impacts innovation performance. However, given the low R-squared value, it can be inferred that while the impact is significant, it is not substantial, indicating that other factors outside this model may contribute more to innovation performance.

Table 4 provides insights into the individual impact of each independent variable on innovation performance. The constant value is 3.897, indicating the expected level of innovation performance when all independent variables are zero.

Table 4: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant	3.897	0.177		23.109	0.000
	TI	0.148	0.063	0.149	2.819	0.009
	OR	0.069	0.032	0.075	2.416	0.017
	RS	0.097	0.058	0.197	1.669	0.096

a. Dependent Variable: IP

The unstandardized coefficient for Technological Infrastructure (TI) is 0.148 with a standard error of 0.063, resulting in a standardized beta coefficient of 0.149. The t-statistic is 2.819, and the p-value is 0.009, which is below the 0.05 significance threshold. This suggests that technological infrastructure positively and significantly impacts innovation performance. The beta coefficient indicates that for every unit increase in TI, innovation performance is expected to increase by 0.148 units, holding all other factors constant. This finding underscores the importance of robust technological infrastructure in fostering innovation. Access to advanced technologies and reliable IT resources is critical for companies aiming to improve efficiency, develop new products, and enhance competitive advantage. This aligns with existing literature that points to technological infrastructure as a key driver of innovation in organizations.

The unstandardized coefficient for Organizational Readiness (OR) is 0.069, with a standard error of 0.032, leading to a standardized beta of 0.075. The t-statistic is 2.416, and the p-value is 0.017, which is also below the 0.05 threshold, signifying a statistically significant positive effect on innovation performance. The coefficient suggests that a one-unit increase in organizational readiness leads to a 0.069 unit increase in innovation performance. This positive relationship highlights the critical role of organizational readiness in adopting and implementing innovative practices. Organizations that are prepared in terms of leadership commitment, employee skills, and financial resources are more likely to successfully integrate new technologies and innovation strategies. The findings reinforce the notion that internal readiness and cultural support for innovation are pivotal in driving firm performance and are consistent with studies emphasizing the importance of strategic alignment and human capital in the innovation process. These findings agree with the report of Almehairbi, et al., (2022) and Li et al., (2022) who stated that companies must invest in infrastructure and readiness to achieve high innovation performance

The coefficient for Regulatory Support (RS) is 0.097, with a standard error of 0.058, and a standardized beta of 0.197. The t-statistic is 1.669, and the p-value is 0.096. Although the p-value is slightly above the 0.05 threshold, it is close enough to suggest a marginally significant

impact at a 90% confidence level. The positive coefficient indicates that regulatory support tends to positively influence innovation performance. This suggests that favorable policies, incentives, and clear regulatory frameworks can encourage firms to invest in innovative activities. The close-to-significant result implies that while regulatory support does play a role, it may not be as immediately impactful as technological infrastructure and organizational readiness. However, the marginal significance still underscores the need for regulatory bodies to create conducive environments for innovation, which includes offering incentives, reducing bureaucratic barriers, and ensuring a stable regulatory landscape that promotes investment in innovation. This finding is in line with the assertions of Blichfeldt and Faullant (2021) and Zhou, et al., (2023) who stressed the role of regulatory support in fostering a conducive environment for digital adoption.

Practical Implications

The analysis indicates that all three independent variables—technological infrastructure, organizational readiness, and regulatory support—are positively associated with innovation performance, with varying degrees of significance. Technological infrastructure and organizational readiness have strong, statistically significant relationships with innovation performance, indicating that these are critical areas for firms to focus on to enhance their innovative capabilities. Investments in technology infrastructure should be prioritized to provide the necessary tools and resources that support innovation. Simultaneously, organizations need to foster a culture that values innovation, which includes training employees, aligning leadership with innovation goals, and ensuring the availability of financial resources. Regulatory support, although showing a positive relationship with innovation performance, was only marginally significant. This finding suggests that while favorable regulations can facilitate innovation, other factors may moderate the effectiveness of regulatory support. These could include the actual implementation of policies, the business environment's stability, and the alignment of regulations with industry-specific needs. Policymakers must consider these factors and work closely with industry stakeholders to design and implement policies that genuinely support innovation. The low R-squared value indicates that the model explains only a small fraction of the variability in innovation performance, suggesting that other unexplored factors significantly impact innovation. These could include market dynamics, customer needs, competitive pressures, organizational culture, and external economic conditions. Future research should explore these additional factors to develop a more comprehensive understanding of what drives innovation performance in firms.

5.0 CONCLUSION

The study reveals that technological infrastructure, organizational readiness, and regulatory support positively influence innovation performance, with technological infrastructure and organizational readiness showing stronger effects. These findings emphasize the need for firms to invest in digital capabilities and cultivate a supportive environment for innovation. Regulatory bodies must also play a role in creating policies that encourage and support innovative activities. The moderate explanatory power of the model suggests that a broader range of factors should be considered to fully understand the determinants of innovation performance.

REFERENCES

Almehairbi, K. M. S. S., Jano, Z., & Mosali, N. A. (2022). Structural Relationship of Technology Adoption and Performance Factors in UAE Manufacturing Industry. *International Journal of Sustainable Construction Engineering and Technology*, *13*(4), 320-337

Amini, M., & Jahanbakhsh Javid, N. (2023). A multi-perspective framework established on diffusion of innovation (DOI) theory and technology, organization and environment (TOE) framework toward supply chain management system based on cloud computing technology for small and medium enterprises. *International Journal of Information Technology and Innovation Adoption*, *11*, 1217-1234.

Arpaci, I., Yardimci, Y. C., Ozkan, S., & Turetken, O. (2012). Organizational adoption of information technologies: A literature review. *International Journal of ebusiness and egovernment Studies*, *4*(2), 37-50.

Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. *International business review*, *26*(2), 324-336.

Badghish, S., & Soomro, Y. A. (2024). Artificial intelligence adoption by SMEs to achieve sustainable business performance: application of technology–organization–environment framework. *Sustainability*, *16*(5), 1864.

Baker, J. (2012). The technology–organization–environment framework. *Information Systems Theory: Explaining and Predicting Our Digital Society, Vol. 1*, 231-245.

Bechtsis, D., Tsolakis, N., Vlachos, D., & Srai, J. S. (2018). Intelligent Autonomous Vehicles in digital supply chains: A framework for integrating innovations towards sustainable value networks. *Journal of cleaner production*, *181*, 60-71.

Blichfeldt, H., & Faullant, R. (2021). Performance effects of digital technology adoption and product & service innovation–A process-industry perspective. *Technovation*, *105*, 102275.

Bustinza, O. F., Gomes, E., Vendrell-Herrero, F., & Baines, T. (2019). Product–service innovation and performance: the role of collaborative partnerships and R&D intensity. *R&d Management*, *49*(1), 33-45.

Carlan, V., Sys, C., Vanelslander, T., & Roumboutsos, A. (2017). Digital innovation in the port sector: Barriers and facilitators. *Competition and regulation in network industries*, *18*(1-2), 71-93.

Chittipaka, V., Kumar, S., Sivarajah, U., Bowden, J. L. H., & Baral, M. M. (2023). Blockchain Technology for Supply Chains operating in emerging markets: an empirical examination of technology-organization-environment (TOE) framework. *Annals of Operations Research*, *327*(1), 465-492.

Cho, Y., Shaygan, A., & Daim, T. U. (2019). Energy technology adoption: Case of solar photovoltaic in the Pacific Northwest USA. *Sustainable Energy Technologies and Assessments*, *34*, 187-199.

Elia, G., Margherita, A., & Passiante, G. (2020). Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process. *Technological Forecasting and Social Change*, *150*, 119791.

Engholm, A., Björkman, A., Joelsson, Y., Kristoffersson, I., & Pernestål, A. (2020). The emerging technological innovation system of driverless trucks. *Transportation research procedia*, *49*, 145-159.

Ghobakhloo, M., & Ching, N. T. (2019). Adoption of digital technologies of smart manufacturing in SMEs. *Journal of Industrial Information Integration*, *16*, 100107

Hong, J., Liao, Y., Zhang, Y., & Yu, Z. (2019). The effect of supply chain quality management practices and capabilities on operational and innovation performance: Evidence from Chinese manufacturers. *International Journal of Production Economics*, *212*, 227-235

Inac, H., & Oztemel, E. (2021). An assessment framework for the transformation of mobility 4.0 in smart cities. *Systems*, *10*(1), 1.

Ladu, L., Koch, C., Ashari, P. A., Blind, K., & Castka, P. (2024). Technology adoption and digital maturity in the conformity assessment industry: Empirical evidence from an international study. *Technology in Society*, *77*, 102564.

Lafuente, E., Solano, A., Leiva, J. C., & Mora-Esquivel, R. (2019). Determinants of innovation performance: Exploring the role of organisational learning capability in knowledge-intensive business services (KIBS) firms. *Academia Revista Latinoamericana de Administracion*, *32*(1), 40-62.

Lammers, T., Tomidei, L., & Trianni, A. (2019, August). Towards a novel framework of barriers and drivers for digital transformation in industrial supply chains. In *2019 Portland International Conference on Management of Engineering and Technology (PICMET)* (pp. 1-6). IEEE.

Lin, C. H., & Chen, W. H. (2023). A technology-organization-environment (TOE) framework based on scientometry for understanding the risk factors in sustainable water resources management. *Water Resources Management*, *37*(15), 5849-5869.

Matthess, M., Kunkel, S., Dachrodt, M. F., & Beier, G. (2023). The impact of digitalization on energy intensity in manufacturing sectors–A panel data analysis for Europe. *Journal of cleaner production*, *397*, 136598.

Nguyen, T. H., Le, X. C., & Vu, T. H. L. (2022). An extended technology-organization-environment (TOE) framework for online retailing utilization in digital transformation: Empirical evidence from Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(4), 200.

Nikou, S., De Reuver, M., & Mahboob Kanafi, M. (2022). Workplace literacy skills—how information and digital literacy affect adoption of digital technology. *Journal of Documentation*, *78*(7), 371-391.

Noussan, M., & Tagliapietra, S. (2020). The effect of digitalization in the energy consumption of passenger transport: An analysis of future scenarios for Europe. *Journal of Cleaner Production*, *258*, 120926.

Ofosu-Ampong, K., Asmah, A., Kani, J. A., & Bibi, D. (2023). Determinants of digital technologies adoption in government census data operations. *Digital Transformation and Society*, *2*(3), 293-315.

Pinho, J. C. (2008). TQM and performance in small medium enterprises: The mediating effect of customer orientation and innovation. *International journal of quality & reliability management*, *25*(3), 256-275.

Plewa, C., Troshani, I., Francis, A., & Rampersad, G. (2012). Technology adoption and performance impact in innovation domains. *Industrial Management & Data Systems*, *112*(5), 748-765.

Rajapathirana, R. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge*, *3*(1), 44-55.

Riedl, R., Stieninger, M., Muehlburger, M., Koch, S., & Hess, T. (2023). What is digital transformation? A survey on the perceptions of decision-makers in business. *Information Systems and e-Business Management*, 1-35.

Sabbah, H., Trabulsi, H., Chbib, R., & Sabbah, I. (2019). Cloud Computing in Lebanese Enterprises: Applying the Technology, Organization, and Environment (TOE) Framework. Journal of Computer and Communications, 7(10), 21-35.

Shahadat, M. H., Nekmahmud, M., Ebrahimi, P., & Fekete-Farkas, M. (2023). Digital technology adoption in SMEs: what technological, environmental and organizational factors influence in emerging countries?. *Global Business Review*, 09721509221137199.

Shen, B., Zhu, C., Li, Q., & Wang, X. (2021). Green technology adoption in textiles and apparel supply chains with environmental taxes. *International Journal of Production Research*, *59*(14), 4157-4174.

Usai, A., Fiano, F., Petruzzelli, A. M., Paoloni, P., Briamonte, M. F., & Orlando, B. (2021). Unveiling the impact of the adoption of digital technologies on firms' innovation performance. *Journal of Business Research*, *133*, 327-336.

Vial, S. (2019). *Being and the Screen: How the Digital Changes Perception. Published in one volume with A Short Treatise on Design*. MIT Press.

Zhao, Y. (2021). Examining Digital Entrepreneurship: The Goal of Optimization of Transformation Path Normal Education in China. *Frontiers in Psychology*, *12*, 766498.

Zhou, Y., Yang, C., Liu, Z., & Gong, L. (2023). Digital technology adoption and innovation performance: a moderated mediation model. *Technology Analysis & Strategic Management*, 1-16.

Zhoua, J., Liub, Z., & Lib, J. (2022). Market Dissimilarity, Technology Complementarity and Collaborative Innovation Performance: The Moderating Effects of IT Adoption

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

ENVIRONMENTAL SUSTAINABILITY AND THE CULTURAL TOURISM XENUS: NIGERIA'S CONTEXT

AGBEBAKU, Henry Usiobaifo[1] & MAJEBI, Enesi Chukwuemeka[2]
[1]Department of Environmental Science, National Open University of Nigeria, Nigeria
[2]Department of Tourism, National Open University of Nigeria, Nigeria.
Corresponding Author e-mail: hagbebaku@noun.edu.ng

ABSTRACT
This article explores the nexus between cultural tourism and environmental sustainability in Nigeria's destination context. Extant literature on the subject matter was content analysed, and existing and emergent themes were developed for conceptualisation and discussion. The themes discussed in this article include the concepts of the environment, tourism, cultural tourism, economic development, tourism business, and environmental sustainability in Nigeria's context. This includes discussions on the earth as a resource concept and the role of cultural tourism in community development and environmental sustainability. In addition, the emergent themes, including accessibility and attractiveness of tourist sites/businesses, schemes for the establishment of tourist/recreational facilities, review of biodiversity and cultural value potentials, economic benefits, fostering community pride, strengthening relationships, and value training were discussed. The article concludes by emphasizing the importance of cultural tourism and highlights the need for efficient environmentally sustainable practices including effective waste disposal, reduced air pollution, and ethical cultural heritage conservation measures.

Keywords: *Environment, Environmental sustainability, Cultural tourism, Socioeconomic impact*

1.0 INTRODUCTION
The environment serves as the totality of our immediate surroundings which functions as the condition and circumstance affecting people's lives. It is the complexity of physical, chemical, and biotic factors upon which an organism or an ecological community ultimately determines its form and survival (Encyclopedia Britannica, 2015; Agbebaku, 2019). The studies of Odiette (1993), Ayo (2015), and Agbebaku (2021) state that any damage done to the environment such as environmental pollution and degradation runs down capital, which sooner or later reduces the value of its recurrent services. But where and when the environment is harnessed, remediated, and managed such as for recreation and tourism development or where waste materials are recycled then the environment can be a resource and serve as a revenue generation such as in the case of cultural tourism and environmental sustainability (Majebi and Anierobi, 2017; Agbebaku, 2019; Majebi and Agbebaku, 2023; Majebi & Amalu, 2023). The implication of this is that there is a need for sustainability of the environment and its resources for future use. Thus, there exists some level of synergy, interactions, and dependency between and among the spheres of the ecosystem to maintain and sustain environmental balance. For example, in each of the 6 geo-political zones within the Nigerian context, the nature and states of the ecosystem play some vital roles in cultural tourism and environmental sustainability and revenue generation of the earth resources to the state and recognition to Nigeria as a tourist nation. Just as there are some levels of synergy between the components of the ecosystem towards environmental sustainability and revenue generation so also there are synergies between cultural heritage, carnival, and tourism. For instance, cultural tourism in each of their respective zones takes advantage of the ecosystem resources via natural landscape and human heritages within their areas to enhance environmental sustainability and revenue generation of the earth's physical and human-cultural resources (Odiette, 1993; Ivbijaro and Akintola, 2012; Ayo, 2015; Majebi & Amalu, 2023).

The biggest and most populous cultural heritage festivals celebrated in Nigeria across the six geo-political zones that enhance environmental sustainability and revenue generation include; (a)Eyo, Badagry, Black Heritage, and Egugun cultural heritage festivals in Lagos and across the south-western states (South-West), (b)Imo Awka festival and New Yam festivals in Imo and across the south-eastern states (South-East), (c)Igue, Feast of Anyan. Oro, Ekpo, and Eset (Ise) Feasts and Calabar Festivals in Edo, Akwa-Ibom and Cross-River states (South-South), (d)Ogani, Ijakadi, Akata and Abuja Carnival in Kogi, Kwara, Benue states and FCT, Abuja (North-Central), (e)Argungu Fishing and Durban Festivals in Kebbi and across the northern states (North-Central), and (f)Cultural Melting Pot, Kamo cultural and Durdan festivals in Adamawa, Gombe and across the north-eastern states (North-East), (Humphreys &

Plumber, 2015; Baloch, Shah, Iqbal, Sheeraz, Asadullah, Mahar, & Khan, 2023; Majebi & Amalu, 2023).

Consequently, the celebrations of cultural festivals promote arts and events that are peculiar to a particular culture and region. Thus, these festivals of celebration give people an incredible insight into people's history because the events are colorful and unforgettable experiences. Nigeria is renowned for many things, one of them being its diverse culture. The country has more than 260 million citizens divided into more than 300 tribes or ethnic groups. This diversity and cultural celebration make Nigeria the perfect place for traditional, religious, social, and cultural festivals. Societies, groups, and communities sharing similar beliefs often partake in festivals together such as the case of the new yam cultural celebration (south-south) and the Durdan festival by the Muslim folks (Northerly), which calls for sustainability. Thus, the term sustainable development connotes an effective management of the earth's resources for the improvement and sustainability of the environment's biotic and abiotic resources which comprise the natural (humans, plants, animals) and modified social-cultural non-living things such as the cultural heritage and tourism development. Consequently, sustainable development major mainly on the indices of environmental degradation, pollution, waste management, human development, and governance, the environmental impact of conflict, health, housing, and urban development, policies and programmes, transportation and infrastructural facilities, the environmental impact of the project and projected impact on climate change (Ivbijaro and Akintola, 2012; Agbebaku, 2019; Parga Dans and Alonso González, 2019; Baloch et al. 2023).

Nigeria is a country known for its rich cultural diversity with over 300 ethnic groups, each having its unique traditions and cultural practices. Thus, cultural events serve as a platform to showcase and preserve these traditions, promoting unity and understanding among the different ethnic groups. There is a clear indication that cultural heritage promotes tourism development, and the duo can bring communities together and instil a sense of community pride and knowledge of their history and events, teach people new things, and strengthen relationships. Thus, the economic benefits of festivals are easiest to see and most often cited festivals attract visitors, which stimulates the growth of tourism and other businesses in a town or region. The social benefits of festivals are less visible, but they are just as important (Humphreys & Plumber, 2015; Parga Dans and Alonso González, 2019; Baloch et al. 2023; OECD, 2023; Majebi, Agbebaku, Anierobi & Afolayan, 2023).

But hosting festivals and carnivals also poses challenges. There are risks and costs related to these efforts. For instance, a star performer might not show up, or the stage might collapse. Insurance can cover financial risk, but reputational damage is harder to address. Nonetheless, festivals and carnivals bring about the following to an area, state, and region; (a)boosting the economy, (b)fostering community pride, (c)teaching new things, (d)strengthening relationships, and (e)value of training. Thus, as cultural tourism is becoming increasingly popular, it is important to ensure that this form of tourism is sustainable and beneficial for both the visitors and the local communities. Sustainable cultural tourism refers to tourism that respects and preserves the cultural heritage and traditions of the local community, while also providing economic benefits and opportunities for the community. In this section, we will discuss some best practices for sustainable cultural tourism from different points of view, including visitors, local communities, and tourism operators. Many studies (Ivbijaro, 2012; Cyril and Olumide, 2016; Ajake, Enang, Amalu & Ojugbo, 2016; ACB Consulting Services, 2021; OECD, 2023; Majebi and Agbebku, 2023; UNWTO, 2024) on cultural tourism and environmental sustainability have been conducted. However, it does not seem that any of these studies investigated the nexus of cultural tourism and environmental sustainability on human health and as a resource for revenue generation in Nigeria, especially in the context of a Nigerian destination.

Thus, this chapter presents discussions on the cultural tourism and environmental sustainability nexus in Nigeria's context.

This is especially important as Nigeria comprises 6 geo-political zones (Northcentral, Northeast, Northwest, Southeast, South-south, and Southwest with rich cultural diversity and over 300 ethnic groups and numerous festivals, feasts, and carnivals celebrations across these geo-political zones. Although no reliable data on international visitors/tourists arriving for cultural-related festivals, the implications for environmental sustainability when many tourists arrive at destinations cannot be overemphasized. This is despite the potential of cultural tourism for revenue generation, source of livelihoods, and general well-being of tourists and locals. Therefore, the discussion in this chapter focuses on the conceptualization of the environment, tourism, cultural tourism, economic development, tourism business, and environmental sustainability in the context of cultural tourism. This includes discussions on the earth as a resource concept and the role of cultural tourism in community development, among other emergent themes in this chapter. This includes highlighting the importance

of cultural tourism and environmental sustainability practices for efficient cultural heritage and value preservation, efficient waste management, and reduced air pollution.

2.0 CONCEPTUAL ISSUES

The Concept of the Environment

The environment is faced with several problems that can impact on its sustainability. The concept of environment is all-encompassing, including natural, organic living, inorganic, and non-natural phenomena. The environment also connotes the relationship between all living species with the natural resources and other components of their environment. The activities of humans are largely attributable to the problems of the environment as they exploit the environment for their benefit in an unstainable manner. According to Baloch et al. (2023), environmental problems are evident in deforestation, overpopulation, exhaustion of natural resources, accumulation, and improper disposal of solid waste and sewage. These environmental problems result in air and water pollution, acid rain, amplified carbon dioxide levels, depletion of the ozone, climate change, global warming, extermination of species (Agbebaku, 2019), and tourism among other sectors can contribute to environmental problems.

The Tourism Concept

Tourism is defined as the processes, activities, and outcomes arising from the relationships and interactions among tourists, tourism suppliers, host governments, host communities, and surrounding environments that are involved in attracting and hosting visitors (Majebi, 2021; Goeldner & Ritchie, 2003). It contributes largely to environmental problems. According to the 2023 United Nations Tourism (UN Tourism, 2024) Word Tourism Barometer, international tourism ended in 2023 at 88% of the pre-COVID-19 pandemic levels with an estimated 1.3 billion international arrivals. The mobilization of these huge numbers of tourists across the globe for various types of tourism, including cultural tourism, despite its socioeconomic benefits (e.g. employment, wealth creation, and improved GDP) can have implications for climate change due to air pollution from aircraft and other modes of transportation, and environmental sustainability.

The Cultural Tourism Concept

Cultural tourism refers to specific tourism that motivates tourists to explore and experience cultural attractions in tourist destinations (Li et al., 2022). It is one of the largest and fastest-growing global tourism markets (OECD, 2023). UNWTO (2023), reports that around 40% of all tourists identify culture as the main motivation for travelling. Cultural tourism no doubt helps to boost the revenue of host destinations. Thus, cultural tourism is an essential aspect of tourism that has grown in popularity over the years. It involves travelling to a destination to experience the cultural heritage of the place, including its customs, traditions, and arts. The importance of cultural tourism is that it helps in enhancing community income, preservation of cultural heritage, and promotion of intercultural understanding.

Cultural tourism creates a platform for locals to showcase their cultural heritage and provides tourists with an opportunity to learn and appreciate the culture of others (Majebi and Anierobi, 2017; Majebi & Amalu, 2023). Nonetheless, when tourists visit destinations to explore various attractions, their visitation can also have implications for the destination in terms of excessive traffic flow which damages cultural tourism sites (Para Dans and Alonso Gonzalez, 2019) and causes pollution. The cultural tourism concept has generated theoretical recognition from scholars, as it contributes significantly to the reconciliation of tensions among localities, ethnicities, and countries through various events (Baloch, et al. 2023; Majebi & Amalu, 2023). Thus, in many destinations across the globe, inclusive of Nigeria, cultural tourism events are common in the communities across the six geopolitical zones. The typology of cultural events in Nigeria ranges from marriage ceremonies, chieftaincy title acquisition ceremonies, naming ceremonies, burial ceremonies, masquerade festivals, Christmas festivals, carnival festivals, dancing festivals, and sports festivals (Majebi and Anierobi, 2017; Ajake et al., 2016; Amalu and Ajake, 2014). Cultural events play an important part in the life of a community as they help promote and exhibit people's value systems, assist in promoting emotional well-being, enable the exchange of cultural knowledge, promote social cohesion, and unite communities with similar or common value systems (Majebi and Anierobi, 2017; Humphreys and Plumber, 2015; Amalu and Ajake, 2015). According to Buckley, 2012 in Baloch, et al. 2023, it helps in balancing tourism management, heritage conservation, social pressures., and some aspects of economic development that encompass a holistic approach to environmental sustainability in a destination attraction context.

The Cultural Tourism and Economic Development Concept

Cultural tourism can be an effective tool for economic development in communities, with the potential to increase income and promote the preservation of local culture. By attracting visitors who are interested in experiencing the unique customs, traditions, and history of a place, cultural tourism can

create economic opportunities for local businesses and individuals. This, in turn, can lead to the revitalization of historic areas and the development of new tourism-related infrastructure. Additionally, cultural tourism can encourage community members to take pride in their cultural heritage, leading to a greater sense of identity and connection to their heritage. Thus, cultural tourism can provide a significant economic boost to communities. Visitors who are interested in experiencing local culture are likely to spend money on local goods and services, including food, lodging, transportation, and souvenirs.

This can create new job opportunities and support the growth of local businesses. For example, in Bali, Indonesia, cultural tourism has become a major source of income for the local economy, with visitors attracted to the island's unique culture, including its art, music, and dance. Cultural tourism can also help to preserve local culture and heritage. When communities recognize the economic value of their cultural heritage, they may be more motivated to invest in its preservation. This can include the restoration of historic buildings, the creation of cultural centres or museums, and the revitalization of cultural traditions. For example, in New Orleans, Louisiana, cultural tourism has played a role in the preservation of the city's unique music, food, and architecture, which are all important parts of its heritage. Cultural tourism can encourage community members to take an active role in preserving and promoting their cultural heritage. This can include participation in cultural events and festivals, as well as the sharing of local knowledge and traditions with visitors. This involvement can help to create a sense of pride and ownership in the community's cultural heritage. Tourists can also patronize tourism businesses when visiting for cultural tourism purposes.

Tourism Business

According to the Fundamentals of the Tourism Businesses (FTB, 2013), the tourist business (TB), means any type of business and ideas in the tourism sector. This type of business includes a tourist home, hotel, motel, trailer court, recreational vehicle, and park that are privately owned or privately managed. These kinds of businesses include campgrounds, lodging intended for short-term occupancy, restaurants, tourism attractions, and tourism activity providers (FTB, 2013; Majebi & Anierobi, 2017). The TB means a business relating to guiding tourists for touring or for other purposes of travelling and providing services such as food, relaxation, recreation, transport, accommodation, and entertainment for people who are on holiday, research, photography, tours, and display of artworks (Mabogunje, 1999; Eseigbe, 2021). Thus, other types of tourist business ideas are souvenir shops, hiking gear rentals, running a travel blog or becoming a travel blogger, or even providing catering for tour and activity operators (FTB, 2013). The importance of Urban Open Green Spaces (UOGS) cannot be ruled out completely from the TB. This is because the UOGS enhances the psychological and emotional well-being of humans (visitors and residents) through the services it renders (ACB Consulting Services, 2021; Majebi et al., 2023).

Thus, in the Nigerian context, the types of the tourism industry for TB include the provision of; (a)Accommodation such as inns, resorts, lodges, cabins, guest ranches, hotels, motels, and campgrounds, (b)Transportation such as rental cars, charter boats, ferries, water taxis, and motor homes, (c)Attractions such as museums, cultural centres, art galleries, craft villages, gardens, rocks, theme parks and zoos, golf and country clubs, waterfront park, lakes, and outdoor adventure opportunities, (d)Tour Operators such as outdoor or culinary adventure, motor and boat cruise, cruise and fishing tour operators, local sightseeing tour companies and urban open and green space, and (e)Corporate Planners such as destination management companies, convention service companies, and event planners (FTB, 2013; Majebi & Anierobi, 2017; Parga Dans and Alonso González, 2019; Eseigbe, 2021; Majebi et al 2023; Baloch et al 2023). Ensuring environmental sustainability while participating in cultural tourism and enjoying service delivery offered by tourism businesses is paramount.

The Environmental Sustainability Concept in the Cultural Tourism Context

The sustainability concept is regarded as an invaluable component of the systems theory and is studied in consonance with the economic, environmental, and social aspects, which helps to determine the fundamental premise of human activities in the qualitative environment via, qualitative climate change, renewable energy, conserve water, deforestation, pollution, biodiversity loss, agriculture, implementing sustainable practices depleting monaural resources, ocean acidification, reduce emissions, resource depletion, soil degradation, effective waste management, and desertification etc (Dhir et al., 2021; Yang et al., 2021 in Baloch, et al. 2023). Essentially, the environmental sustainability of tourist attractions, including cultural events at destinations has implications for effective tourism management and cultural heritage protection (Awan and Sroufe, 2022 in Baloch, et al. 2023). Moreover, the findings of a recent study suggest that excessive tourist visits to destination attractions (including cultural attractions) can have negative

consequences for the environment and its ecological settings (Frey and Briviba, 2021 in Baloch, et al. 2023). International tourists (and domestic tourists) significantly contribute to the emission of CO2 gas at destinations both in the short and long term (Akadiri et al., 2019 in Baloch, et al., 2023). This has consequences for the deterioration of environmental sustainability. Nonetheless, another study shows that diverse stakeholders and leadership are more likely to develop environmental strategies that contribute to sustainability at the destination (Figueroa-Domecq et al., 2021 in Baloch, et al., 2023). The enrichment of cultural tourism resources devoid of practices that affect environmental sustainability can help to attain a safe and hygienic environment that could encourage sustainability-conscious tourists to revisit destinations for cultural tourism-related events.

The Earth as a Resource Concept

The earth's resources connote anything within the environment that is useful to man. These include both living and non-living things found within the components of the environment. It also encompasses useful materials and substances as well as other forces like wind and vegetation that are useful to man. A resource can be annexed in dynamic ways by processing and transforming or in the form of a rotational circle for; economic, ethical, behavioural, ecological, and cultural tourism development. Generally, there are six types of environmental resources including atmospheric, water, vegetation, land, minerals, and humans. These six types of resources enhance cultural heritages and tourism development for revenue generation. Furthermore, resources of the earth can be classified as (a) a product for man's benefits e.g. plants and timbers, and (b) amenities, where it is used and derive benefits in their natural state e.g. light. In addition, a resource can be described from the perspective of management and conservation and can be viewed as; (a) wasteful e.g. household waste and reusable e.g. precious stones, (b)exhaustible e.g. forest, water, petroleum, and in-exhaustible e.g. atmospheric and nitrogen and (c) renewable e.g. soil, water and non-renewable e.g. coal, mental (Wright and Nebel, 2012; Cunningham and Cunningham, 2015; Ajake, Enang, Amalu & Ojugbo, 2016; Agbebaku, 2019; Agbebaku, 2021).

The Future of Cultural Tourism and Its Role in Community Development

Cultural tourism is a vital aspect of community development, and it has a promising future ahead. In recent years, there has been an increasing interest in cultural tourism, and it has gained recognition as a tool for sustainable development. It has the potential to create jobs, increase income, and preserve cultural heritage. Additionally, cultural tourism can promote intercultural understanding and social cohesion. The future of cultural tourism depends on how well it can adapt to the changing needs and preferences of tourists. According to the studies of Majebi and Anierobi (2017), Parga Dans and Alonso González (2019), Majebi et al (2023), Baloch et al (2023), and OECD (2023), the insights on the future of cultural tourism and its role in community development are as follows:

(a)Technology will play a significant role in shaping the future of cultural tourism. With the rise of augmented reality and virtual reality, tourists can experience cultural heritage sites and activities in a new and immersive way. This can enhance the tourist experience and attract more visitors to cultural tourism destinations. (b)Sustainability will be a key consideration in the future of cultural tourism. Communities and tourism operators must work together to ensure that cultural tourism activities are sustainable and do not harm the environment or cultural heritage sites. Sustainable practices can also attract tourists who are concerned about their impact on the environment.

Furthermore, (c)Collaboration between different stakeholders is crucial for the success of cultural tourism. Communities, tourism operators, governments, and non-governmental organizations must work together to create a supportive environment for cultural tourism. This can involve developing infrastructure, providing training and education, and promoting cultural tourism destinations. (d)Cultural tourism can have a positive impact on community development. It can create jobs, increase income, and promote the preservation of cultural heritage. For example, in the towns and cities of Badagry, Lagos, Calabar, Cross-River, Akwa, Imo, Benin, Edo, Nigeria, and Ollantaytambo, Peru, South America the communities have developed cultural tourism activities that showcase their traditional way of life. This has created jobs for local people and helped to preserve their cultural heritage. (e)Cultural tourism can also promote intercultural understanding and social cohesion. When tourists engage with local communities and learn about their culture, it can break down stereotypes and promote understanding between different cultures. This can have a positive impact on social cohesion both within communities and between different communities. Consequently, cultural tourism has a bright future ahead, and it can play a significant role in community development. By embracing technology, promoting sustainability, collaborating between stakeholders, and promoting intercultural understanding, cultural tourism can continue to grow and thrive in the years to come.

3.0 RESEARCH METHODS

This chapter utilized both primary data and literature from secondary sources, including academic articles and existing data sources from Google Scholar, which were complemented by the researchers' observations for data collection and analysis. In addition to questionnaire administration, interviews were conducted with the key community stakeholders. A total of 330 copies of questionnaires were administered across the 7 selected states and the FCT, Abuja. For this study. The selected areas are Kano, Plateau and Abuja (North), Lagos, Osun and Ogun (Southwest) and Cross-River and Akwa-Ibom (South-south). From the total number of 330 administered questionnaires, 300 were returned while a total of 30 were unreturned.

This signified that only 90% which accounts for 300 copies of the questionnaires were used for the study while 10% which accounts for 30 could not be retrieved across the 8 selected areas where cultural tourism thrives and the need for environmental sustainability. Thus, from the 300 copies that constituted the sample size, a default number of 37 copies were administered to visitors and stakeholders in each of the 8 selected areas while the remaining 4 copies were administered across selected groups, such as traditional leaders/community/village head, government agencies and investors in the tourism business bring the total to 300. Descriptive statistical methods were used for the study. Thus, the results and discussion retrieved were content analyzed and presented based on existing and emergent themes associated with the concepts of cultural tourism and environmental sustainability nexus in Nigeria's context.

4.0 RESULTS AND DISCUSSION

4.1 Revenue Generation through Environmental Resources and Cultural Tourism Development.

Revenue generation to the Nigerian federation is achievable where the potentials of the environment are well harnessed, modified, managed, and protected and where the people are law-abiding (Adesina-Uthman et al., 2023; 2023; Majebi & Amalu 2023). The study of Majebi & Amalu (2023) and Majebi & Anierobi (2017) identified the importance of cultural tourism to the socioeconomic development of Nigeria's destinations, including its opportunities for increased revenue generation and general community livelihood. The wide range of resources in Nigeria's environment, including her physical and social-cultural attributes can enhance the livelihoods of host communities, especially with improved social infrastructure and security (Adesina-Uthman et al., 2023; 2023; Majebi & Amalu 2023). This can be achieved in collaboration with the community and public and private stakeholders.

4.2 Accessibility and Attractiveness of the Tourist sites/businesses

In the context of urban planning, physical development, and environmental sustainability, the drives for infrastructural facilities, and recreational and tourism enhancement are essentials for human well-being and revenue generation. The establishment of the major tourist sites/business centers (TBC) and supportive urban green spaces (UGS), including parks, gardens, and other greenification areas creates harmony in the built environment that cannot be taken for granted (Majebi & Anierobi, 2017). These facilities and services are some of the essential considerations that need to be put in place by stakeholders, including private and government agencies. This is because there is a spatial connection between and among the components of the urban built from the mix of natural and modified environments for the well-being of humans and environmental management.

Thus, the benefits of TBC and UGS facilities and services for human improvement and development include (a)pleasure and site visitation (b)improving our day-to-day lives and human health (c)boosting mental and physical health, (d)promoting peace and relaxation (e) improving air quality and reduces premature mortality, (f)enhancing biodiversity, (g)moderating temperature during hot periods, (h)provision of cool spots and shaded areas, (i)protecting and enhancing safety environment, (j)creating excursion, scientific discoveries and technical jobs (k)improving the enabling environment (l)sparking youth's interest in tourism and hospitality ventures, and (m)cooperation with countries around the world. Furthermore, the accessibilities and attractiveness of these facilities and services for improved environmental sustainability are as follows; (a)ecosystem balance, (b)nature-friendly (c)conservation of biotic life, (d)enhancing urban planning and physical development, and (e)aesthetic environment for quality air and land resource (TBE, 2013; Cyril and Olumide, 2016; Agbebaku, 2019; Ezenagu, Diminyi, Olabinjo, 2019; Majebi et al., 2023).

4.3 Scheme on Establishment of Tourist/Recreational Facilities

In recent times, the ventures of hospitality and recreational business irrespective of their types and kinds yield income generation as people are bound to relax their nerves and chill out on certain occasions such as that of cultural heritage, festivals, and carnivals. Such establishments as resort centres, parks/gardens, weather stations, museums, hospitality, ranches, tourist sites, zoological and biological gardens, and event centres will not only create job opportunities and tourist attraction but enhance incomes and revenue generation to community,

state, and federal government to areas where such ventures are domiciled. If these gestures are extended across the 774 local government areas of the federation, there will be more income generation to governments from service rendered and tax levies from these facilities or establishments as observed in cities like Abuja (Nigeria), Dubai (United Arab Emirate), Johannesburg (South Africa) and Melbourne (Australia). In these schemes, revenue generation will continue to outweigh the cost of production as the value of these facilities will continue to appreciate upwards with better management, innovation, and technology (TBE, 2013; Cyril and Olumide, 2016; Agbebaku, 2019; Ezenagu, Diminyi, Olabinjo, 2019; Agbebaku, 2021; Majebi et al., 2023).

4.4 Review of Biodiversity and Cultural Value Potentials

The ecosystem of plants and animals of economic value should be well harnessed, managed and protected from extinction of these potential resources. Such an ecosystem should be protected and devoid of inadequate supplies of energy, and materials, and the removal of waste matters for a balanced state and smooth functioning of the system. The influence of interactions, associations, and inter-dependences of biotic and abiotic environments should be paramount toward their growth, distribution, behavior, and organisms for harnessing their value potentials. Both the private and government entities should intensify efforts to harness and manage areas where these value chains potential habitats and ensure their safety for future income-driven generations. In addition, more government reservation areas should be set up to complement the existing ones at strategic locations. A well-managed biodiversity ecosystem with abundant species and products will boast revenue generation for tourist attractions and excursion purposes as in the case of Yankari game reserve (Bauchi), Obudu ranch (Cross-River) as well as the large stretch of potential forest reservation land that cut across Edo and Ondo states. These ecosystems with huge resources of biodiversity potential where managed and protected will boast drives and revenue generation to the government. The cultural monumental centres such as; the Badagry slave centre and black heritage festival (Lagos state), Fishing Festival (Benue state), Abuja and Benin Festivals of Art and Culture (FCT, Abuja and Edo state), Argungu Fishing Festival (Kebbi state), among others (Amalu and Ajake, 2014; Ajake et al 2016; Majebi and Anierobi, 2017; OECD, 2023; Majebi et al., 2023).

4.5 Economic Benefits

Cultural tourism can generate income for the local community by creating job opportunities and boosting the local economy. Tourists who visit cultural sites often spend money on accommodation, transportation, food, and souvenirs, which can benefit the local businesses and revenue generation to the government. In one of the simple definitions of cultural tourism, festivals attract visitors, and visitors spend money, which boosts the local economy both on and off the festival site. On-site spending includes admission fees, parking fees, food, beverage, and souvenir sales, and more. But off-site spending related to festivals generates revenue for communities, too.

For example, visitors stop at local gas stations, souvenir shops, and restaurants, the list goes on. Thus, overnight visitors provide another source of off-site revenue to communities that host festivals. Consequently, festivals also provide free marketing and advertising for local businesses as visitors talk about their fun experiences when they go back home. If visitors post comments and photos about their experiences on Facebook or other social media, so much the better. The economic benefits of successful festivals ripple throughout a local economy affecting tourism and non-tourism-related businesses alike (TBE, 2013; Amalu and Ajake, 2014; Ajake et al 2016; Majebi and Anierobi, 2017; OECD, 2023).

4.6 Fostering Community Pride

Planning and conducting festivals involve many members of the community, which yields several social-cultural benefits. The best thing about being involved with festivals and events is the opportunity to help build a community, foster a sense of pride within a community, and engage the community. Thus, experts agree that hometown pride is a critical factor in the development and improvement of any community. Residents with community pride are more likely to speak positively about their town to others and to volunteer with organizations and activities that support the common good. Consequently, festivals promote community pride by celebrating things that make a town special and evoke good feelings just like in the case of the annual festivals and carnivals such as Eyo and Black Heritage (Lagos), Argugun Fishing (Kebbi), Abuja and Calabar Festivals (Cross-River and FCT, Abuja), and Durban Festival (across the northern states). Thus, these festivals and carnivals can be as big as ethnic heritage, or as small as a piece of pastry (TBE, 2013; Amalu and Ajake, 2014; Ajake et al 2016; Majebi and Anierobi, 2017; Parga Dans and Alonso González, 2019; OECD, 2023; Baloch et al 2023).

4.7 Strengthening Relationships

Another social benefit of festival sponsorship is stronger relationships within a community. Most of

the relationship-building occurs in the festival planning phase. This is where the bonds among public and private organizations, government, and neighborhood groups are forged and where connections among elected officials, staff, volunteers, and interested residents are made. Assuming everything else goes well, the payoff to this relationship-building is a successful festival. But the benefits last well beyond the event, as people bring their connections and collective knowledge and skills to improve the community. Connections in this context are the glue that holds communities together; without them, a community stagnates, and the quality of life declines. Thus, experts call this glue social capital, so viewed through this lens festival sponsorship increases the social capital that makes for healthy communities (TBE, 2013; Amalu and Ajake, 2014; Ajake et al 2016; Majebi and Anierobi, 2017).

4.8 Value of Training

Hosting a festival is not without risks and costs. While a successful event enhances a community's reputation, a less-than-successful effort (or outright failure) does just the opposite. In the end, festival management means minimizing damage, maximizing opportunity, and revenue generation. To help community leaders achieve these balances, some Universities in Nigeria under the Departments of Tourism Studies offer training and seminars in the essentials of festival and event management. Thus, these festivals and Event Management programs cover strategic planning, site management, budgeting and financial planning, marketing and sponsorship, human resource management and volunteer recruitment, and event evaluation (TBE, 2013; Majebi et al., 2023).

5.0 CONCLUSION AND RECOMMENDATIONS

Cultural tourism has been identified as a significant source of revenue for many communities worldwide. It creates employment opportunities for locals, such as tour guides, translators, and other service providers. Cultural tourism also creates a demand for local products such as handicrafts, food, and textiles, which can help boost the local economy. Cultural tourism plays a crucial role in preserving cultural heritage. It creates awareness and promotes the preservation of cultural sites, monuments, and artifacts. For instance, the sites of the first story building and the slave, monument relics, and trade centres in Badagry, Lagos state serve as a popular cultural tourism destination that hosts the Badagry community. Thus, the Badagry, people have been able to preserve their culture, traditions, and way of life through cultural tourism. Cultural tourism promotes intercultural understanding by bringing people from different backgrounds together. It creates an opportunity for people to learn about other cultures, which can help in breaking cultural barriers and promoting unity. For example, the Carnival of Venice in Italy is a cultural tourism event that attracts people from all over the world. It provides an opportunity for people to learn about Italian culture, which can promote intercultural understanding.

The importance of cultural tourism cannot be overstated. It plays a significant role in enhancing community income, preservation of cultural heritage, and promotion of intercultural understanding. Therefore, relevant destination stakeholders, including government, communities, private investors, and nongovernmental organizations need to promote cultural tourism as it is beneficial to the socioeconomic development of tourist-generating and destination regions. Nonetheless, despite its benefits, cultural tourism can have some implications for environmental sustainability when it is not properly managed. Therefore, to enhance cultural tourism and environmental sustainability, stakeholders must make a concerted effort to collaborate in ensuring the protection of their cultural heritage, ensure efficient waste management, and limit air pollution in their various communities, including providing education to tourists and locals on ethical behaviours.

REFERENCES

Adesina-Uthman, G. A., Majebi, E. C., Fagbolu, O. A., & Obaka, A. I. (2023). Analysis of stakeholders' perceptions of the impact of the crisis on tourism in Ogun State, Nigeria. *International Journal of Tourism Business Research*, 2(2), 37–52. https://doi.org/10.29303/ intour.v2i2.863

ACB Consulting Services, (2021). *The challenges of urban green space and how they might be resolved*. Sustainable Construction Project Management. Online Resource. https://www.acbconsultingservices.com/

Agbebaku, H.U. (2019). An empirical analysis of the indices of environment and sustainable development in Nigeria from 2008 to 2018. *Journal of Geography and Development, Benue State University, Makurdi,* 9(1), 1099-1116.

Agbebaku, H.U. (2021). Ecosystem restoration. A paper presentation to the department of environmental science in preparation for 2021 World Environment Day, in the Faculty of Sciences, NOUN.

Agbebaku, H.U. (2021). The Environment as a Resource for Sustainable Development: Examining Revenue Generation Potentials of the Nigeria Environment. Association of Nigerian Geographers (ANG) 61st Annual National Conference, 2020. Department of

Geography. Obafemi Awolowo University, Ile-Ife, Nigeria. Abstract ID: OAU-ANG-338, 39 – 41

Ajake, A.O., Enang, I.A., Amalu, T.E & Ojugbo, P. (2016). Assessment of cultural and museum landscapes for tourism development: The Calabar museum scenario, Cross River State, Nigeria. Journal of Tourism and Management Research, 1(1), 119–134.

Amalu, T.E., & Ajake, A.O. (2014). Influence of Calabar carnival on the economy of residents of Calabar metropolis, Cross River state, Nigeria. Global Journal, 1(1), 67–81.

Ayo, T. (2015). Critical issues in *environmental sustainability; Forward by Peter Okebukola, Unesco Consultant on the Environment*; Lagos.

Baloch, Q.B., Shah, S.N., Iqbal, N., Sheeraz, M., Asadullah, M., Mahar, S & Khan, A.U. (2023). Impact of tourism development upon environmental sustainability: A suggested framework for sustainable ecotourism. Environmental Science and Pollution Research, 30(3), 5917-5930.

Cunningham, W.P., & Cunningham, M.A. (2015). *Principle of environmental science: Inquiry and applications.* New York, America: McGraw Hill International Publishing Company.

Cyril, K.E and Olumide, A.O. (2016). Assessment of recreational facilities in the federal capital city, Abuja, Nigeria. *Indonesian Journal of Geography, 48(1), 21-27.*

Encyclopedia Britannica, 4. (2015). http;//www.btritannica.com/

Eseigbe, J.O. (2021). *Environmental planning and management*. ESM 346: Course Material of the National Open University of Nigeria, Abuja.

Humphreys, M.H., & Plumber, J.A. (2015). The evil effects of carnival activities: The Caribbean experience. *International Journal of Tourism and Travels*, 106 (2), 176-185.

Ivbijaro, M.F.A and Akintola, F. (2012). Sustainable environmental management in Nigeria. 2, 9-37

Mabogunje, A.L. (1999). *Abuja; the promise, the performance, and the prospects.* In Kalgo, M.S.U and Olatubosun, A (Eds*)*. The Review of Abuja Master Plan. Fountain Publications, Ibadan.

Majebi, E. C. (2021). *An investigation of stakeholders' strategies for external crisis preparedness: The Nigerian tourism industry perspectives* [Doctoral dissertation, Leeds Beckett University]. Figshare. https://doi.org/10.25448/lbu.20402844.v1

Majebi, E. C., Adesina-Uthman, G. A., Adedokun-Fagbolu, O. D., & Obaka, A. I. (2023). Stakeholders' Perception of Socioeconomic Implications of Crises on Tourism in Oyo State, Nigeria. *Sociological Research and Innovation*, 1(1), 1-31

Majebi, E.C., & Amalu, T.E. (2023). Cultural tourism development in Enugu State, Nigeria: Evidence from the Pre and Post Covid -19 Period. *Journal of Archaeology and Tourism Research*, 3 (2), 1-16.

Majebi, E.C and Anierobi, C. (2017). Towards harnessing the potentials of the Rivers State Arts and Cultural Festival (CARNIRIV) for Tourism Development in Port-Harcourt, Nigeria. *Nigeria Journal of Management Research*, 11 (2), 37-50.

Majebi, E.C and Agbebaku, H.U. (2023). Accessibility and Attractiveness of Urban-Green-Space-Management for Tourism Development and Environmental Sustainability in the FCT Abuja, Nigeria. In: İ. Yazicioğlu (Eds.) Green Inspiration (Yeşil İlham), 22-*31.* (ITTD23), Book Chapter. *Ankara Hacı Bayram Veli University Faculty of Tourism, Ankara, Turkey.*

Majebi, E.C., Agbebaku, H.U., Anierobi, C. & Afolayan, S.O. (2023). Assessment of urban open green spaces and environmental impacts on recreation and environmental sustainability: Evidence from Abuja, Nigeria's Federal Capital Territory. Uniben Journal of Geography, Planning and Environment. 3(1), 24-35

Odiette, W.O. (1993). Environmental impact assessment for sustainable development. 1, Nigeria, 56-80.

OECD (2023). The impact of culture on tourism. Retrieved August 10, 2023. https://www.oecd.org/cfe/tourism/theimpactofcultureontourism.htm.

Parga Dans, E and Alonso González, P. (2019). Sustainable tourism and social value at world heritage sites: towards a conservation plan for Altamira, Spain. Ann. Tour. Res. 74, 68–80. doi: 10.1016/j.annals.2018.10.011

Sridhar, M.K.C. (2012). *Waste management policy and implementation in Nigeria.* In F.A. Ivbijaro & F. Akintola (Eds.), Sustainable environmental management in Nigeria (2nd ed., pp. 253-259). Ibadan, Nigeria: Book Builders Publishing Company

Tourism Business Essentials (TBE, 2013). Fundamentals of the tourism businesses. The essential guide to understanding the BC tourism industry. Destination British Columbia. First edition.

UNWTO (2023). Tourism and COVID-19 – unprecedented economic impacts. Retrieved January 20, 2024. https://www.unwto.org/tourism-and-covid-19-unprecedented-economic-impacts.

UNWTO. (2024). *International Tourism to Reach Pre-Pandemic Levels in 2024. Retrieved* January 27, 2024. https://www.unwto.org/news/international-tourism-to-reach-pre-pandemic-levels-in-2024

1st CRIDE INTERNATIONAL CONFERENCE (CIC 2024)
In Collaboration with
National Open University of Nigeria, Abuja.

EFFECT OF BUSINESS PRACTICE ON THE PERFORMANCE OF RICE PROCESSING FIRMS IN NIGER STATE, NIGERIA

[1]Silas Ndace, Olushola E, Omoniyi, Ruth Fatima Kolo & [2]Comfort Bolaji Adeniyi
[1]Department of Entrepreneurship Studies, Federal University of Technology Minna, Nigeria
[2]Department of Entrepreneurship Studies, Bamidele Olumilua University of Education, Science and Technology, Ikere, Nigeria
*silwanciko@gmail.com; sholomvision2@gmail.com; yisaruth10@yahoo.com; adeniyi.bolaji@gmail.com

Abstract
This study examines the effect of business practices on the performance of rice processing firms in Niger State, focusing on strategic orientation, operational efficiency, and knowledge management. Using a quantitative approach, data were collected from a sample of rice processing firms and analyzed to determine the impact of these practices on firm performance. The results show that strategic orientation has a negative but statistically insignificant effect on performance (\(\beta = -0.097\), \(t = -1.669\), \(p = 0.096\)), indicating that the alignment of business strategies with market demands does not significantly influence firm outcomes. Similarly, knowledge management also displays a negative, non-significant relationship with performance (\(\beta = -0.084\), \(t = -1.388\), \(p = 0.166\)), suggesting that the current methods of managing and utilizing knowledge within these firms do not substantially contribute to their performance. In contrast, operational efficiency demonstrates a positive and statistically significant effect on performance (\(\beta = 0.098\), \(t = 1.732\), \(p = 0.084\)), implying that firms with more streamlined and efficient operations tend to perform better. These findings highlight the importance of focusing on operational improvements to enhance performance, while the effect of strategic orientation and knowledge management appears limited under current practices. The study suggests that rice processing firms in Niger State could benefit from refining their operational strategies to achieve better performance outcomes, while further exploration of strategic and knowledge-based practices may be needed to uncover potential value.

Key: Business Practices, Knowledge Management, Operational Efficiency, Performance, Strategic Orientation

INTRODUCTION
The agricultural sector has always played a pivotal role in Nigeria's economy, serving as a major source of employment, income, and food security (Umar, 2024). Within this sector, rice processing is particularly significant, given the country's growing population and the corresponding demand for rice, which is a staple food in most Nigerian households. Despite Nigeria's favourable climate and vast arable land, the nation has struggled with meeting domestic rice demand, leading to a heavy reliance on imports. Consequently, the federal government has made concerted efforts to boost local production and processing of rice, aiming to reduce import dependence and enhance food security. Rice processing firms in Niger State, one of Nigeria's key agricultural regions, have a crucial role in the value chain, transforming raw paddy into consumable rice (Abubakar *et al*., 2023). The performance of these firms, however, is not solely dependent on agricultural output but is also significantly influenced by their business practices. Effective business practices encompass a wide range of strategies, including strategic orientation, operational efficiency, technological adoption, and knowledge management (Rao *et al*., 2023). These practices are essential for enhancing productivity, ensuring quality control, minimizing waste, and improving profitability.

Despite the importance of these business practices, many rice processing firms in Niger State face challenges in effectively implementing them. Factors such as limited access to capital, inadequate infrastructure, and the lack of skilled labour often constrain the ability of these firms to adopt best practices. Moreover, the competitive landscape, characterized by both local and international players, puts additional pressure on these firms to continuously innovate and improve their operations. The performance of rice processing firms is often measured by their profitability, market share, operational efficiency, and the quality of the rice produced (Kim *et al*., 2024). However, to achieve and sustain high performance, these firms must not only focus on the technical aspects of processing but also on the strategic and human resource dimensions of their operations. There is a growing recognition that adopting effective business practices can be a game-changer for firms operating in this highly competitive and essential industry (Rao *et al*., 2023).This study, therefore, seeks to explore the effect of business practices, with a particular focus on strategic orientation and reward philosophy, on the performance of rice processing firms in Niger State, Nigeria. By examining these variables, the study aims to provide insights into how these firms can enhance their performance, contribute to food security, and achieve sustainable growth in an increasingly challenging economic environment.

Objectives of the study

The objective of this study is to:

i. examine the effect of strategic orientation on the performance of rice processing firms in the study area;
ii. determine the effect of operational efficiency on the performance of rice processing firms in the study area.
iii. determine the effect of knowledge management on the performance of rice processing firms in the study area.

In line with the two objectives, the following hypotheses were tested:

H_o: Strategic orientation have no significant effect on the performance of rice processing firms in the study area.
H_o: Operational efficiency has no significant effect on the performance of rice processing firms in the study area..
H_o: knowledge management has no significant effect on the performance of rice processing firms in the study area.

LITERATURE REVIEW

Conceptual Review

Innovation in business practices

Innovation in business practice (IBP) is a subtype of organisational innovation that denotes novel techniques employed by a firm to restructure work routines by modifying or creating management processes and procedures (Dukeov, 2022). It aims to introduce new elements to a firm's behavior (Snihur and Wiklund, 2019; Bibi *et al.*, 2020). IBP entails changing how work routines are organized in a firm by putting new management processes, procedures, and operations in place as well as making other novel management routine adjustments (Volberda *et al.*, 2021). A new organisational method in the firm's business practices would lead to higher efficiency and lower costs.

Innovation in business practice plays a strong role in enhancing the dissemination of knowledge in organisations. When a firm applies new techniques for structuring work routines and procedures, we are talking about innovation in business practices. For instance, novel techniques in rice processing value chain involves: *'Paddy cleaning'*, where straw, weed seeds, soil and other inert materials are extracted from paddy; *'De-husking'*, where the husk layer is separated from paddy by friction, also known as 'De-hulling'; *'Polishing'*, the process where white rice is produced in two forms: full length and broken, after removing the bran layer and the germ, and finally it goes through the process of *'Packaging'*, after which it is stored for distribution'. (Obianefo *et al*., 2023)

Studies have noted that internal firm practices and other related and complementary elements, such as capital investment adoptions, R&D practices, marketing approaches, and human resource management practices, affect firms' growth (Anzola-Román *et al.*, 2020). According to Corsi *et al.* (2019) the deployment of innovative business practices is frequently associated with a beneficial influence on firm growth (Fernando *et al.*, 2019). Indeed, it has been noted that the ultimate result of a firm's business operations is growth (Bos-Nehles and Veenendaal, 2019). Thus, innovative performance, particularly in the form of business practice, is a composite concept built on many performance indices (Hameed and Naveed, 2019). Hence, while the introduction of IBP is sufficient to generate organisational innovation and positively influence firm growth, it implementation in an organisation significantly increases the expected effect on firm outcomes (Guerreiro, 2022).

Strategic Orientation

Strategic orientation (SO) refers to the extensive approach that a corporation takes in order to match its activities and decisions with its long-term aims and objectives (Beliaeva *et al.*, 2020). Aloulou (2019) opined that strategic orientation involves coming up with plans, putting those strategies into action, and adjusting those strategies so that they can attain a competitive edge and satisfy the requirements of the market. The way in which a firm responds to changes in its external environment and how it promotes itself in the market are both influenced by the strategic orientation of the company (Schweiger *et al.*, 2019). A firm's actions, from the establishment of long-term goals to the reaction to changes in the external environment, are guided by the concept of strategic orientation, which is both comprehensive and dynamic (Anees-ur-Rehman and Johnston, 2019). It is a process that is continual and requires thorough analysis, adaptation, and a clear awareness of the position that the organisation holds in the market. The successful implementation of strategic orientation not only assists businesses in surviving in the short term, but it also places them in a position to achieve long-term success that is sustainable (Aloulou, 2019). According to Aloulou (2019), a strategic orientation offers a distinct strategic narrative to direct organisational behaviours and managerial decisions in order to accomplish firm objectives. Every strategic orientation (market, brand, product, technological, entrepreneurial orientation) typically has a distinct strategic scope that contributes to the improvement of the relevant dimension(s) of organisational performance.

However, this study focuses mainly on entrepreneurial orientation which describes the procedures, methods, and modes of decision-making of entrepreneurial firms (Zhang *et al.*, 2020).

The entrepreneurial process is guided by the notion of 'creative destruction,' which seeks market openings and connects them with new products and manufacturing processes (Schumpeter and Swedberg, 2021). The entrepreneurial orientation uses a tactical approach to impact organisational-wide procedures and management style in order to transform the organisation into an entrepreneur (Zhao *et al.*, 2021). This is accomplished by cultivating a culture and behavior of autonomy, innovation, risk-taking, pro-activeness, and competitive aggression. It aspires to be a market-driving method that offers better or more innovative solutions by questioning current market trends (Chen *et al.*, 2020). Thus, by establishing a distinct market position, entrepreneurial enterprises can become market leaders while avoiding market challenges and rivalry. Entrepreneurial orientation enables businesses to compete in their field by taking risks, embracing innovation, and implementing changes to gain a competitive advantage. Organisations that employ mind-set in a dynamic competitive environment are more likely to change their business practices than those that do not (D'angelo and Presutti, 2019).

Operational Efficiency

Operational efficiency refers to a firm's capacity to maximize resources, decrease waste, and streamline operations in order to obtain the best results with the least amount of effort. In the context of rice processing, operational efficiency entails increasing the output of processed rice from raw paddy, minimizing milling losses, and ensuring that processing operations are cost-effective. Several studies have emphasized the importance of operational efficiency in the agribusiness sector, notably rice processing. Shehadeh *et al.*, (2024) underline the importance of operational efficiency in determining competitiveness in the global agriculture market. They contend that businesses that succeed at optimizing their processes are better positioned to decrease costs, boost profitability, and offer high-quality products to the market. Operational efficiency in rice processing can be improved by a variety of methods, including lean management, process optimization, and waste reduction. Lean management, which originated in the manufacturing sector, has been widely used in agriculture to reduce non-value-added tasks, optimize production processes, and increase overall efficiency (Vaezinejad and Schniederjans, 2024). Lean concepts in rice processing can result in considerable increases in milling efficiency, reduced downtime, and lower energy use. Furthermore, process optimization is an important component of operational efficiency. Process optimization is continuously assessing and improving manufacturing processes to increase productivity and lower costs. In rice processing, this could include optimizing the milling process to achieve maximum production from paddy rice, reducing breakage, and enhancing final product quality. Notteboom *et al.*, (2023), firms that invest in process optimization tools and methodologies frequently see improved operational performance and profitability. The importance of operational efficiency is also supported by Tian *et al.*, (2024), who discovered that firms with higher levels of operational efficiency are more likely to achieve economies of scale, lower per-unit costs, and improve their market competitiveness. According to their findings, operational efficiency not only increases the profitability of rice processing enterprises but also contributes to their long-term viability by allowing them to adapt to changing market conditions and resource restrictions.

Knowledge management

New methods of knowledge management (KM) is viewed as collection of processes for comprehending and implementing knowledge strategic capitals in an organisation. It is regarded as a structured strategy that provides methods for appreciating, assessing, organizing, preserving, and using knowledge in order to satisfy the needs and goals of the organisation (Ode and Ayavoo, 2020). Azeem *et al.* (2021) stated that KM is the ability to access knowledge and experience that fosters innovation, enables high performance, and increases customer value. KM is made up of three interconnected processes: knowledge collection, conversion, and application (Martínez-Falcó *et al.* 2024). Areed *et al.* (2021) opined that KM is a key indicator of an organisation's success because it effectively supports the information exchange needed to increase business practice capability.). According to Hock-Doepgen *et al.* (2021), businesses are given the ability to recognize and transform information into creative business prospects through the use of KM. This is done to manage, implement, develop, leverage, and innovative performance (Martínez-Falcó *et al.*, 2024).

Knowledge management strategies, such as staff training, knowledge-sharing platforms, and fostering learning-oriented cultures, are crucial in the rice processing industry. These activities enable enterprises to consistently enhance their operations and effectively respond to new challenges. Training and development programs play a crucial role in the knowledge management of rice processing enterprises. By allocating resources to develop the expertise and understanding of

their workforce, companies can improve their capacity to run intricate machinery, integrate novel technology, and optimize production processes. Duke *et al.* (2023) emphasize that companies that have robust knowledge management processes are more inclined to attain elevated levels of operational efficiency and innovation, which are crucial for long-term survival in the fiercely competitive rice processing business. Knowledge-sharing platforms and col*labora*tive techniques are essential for efficient knowledge management. These platforms enable the exchange of knowledge and best practices among employees, allowing organisations to utilize collective expertise to solve problems and innovate. Efficient sharing and use of information in rice processing can greatly enhance process efficiency and product quality, especially in the face of shared operational issues.

Performance

Performance is defined as an organisation's capacity to make effective use of its financial resources in order to meet its objectives (Ahmad *et al.*, 2020). The essential features and results for each area of responsibility must be measured in order to measure an organisation's degree of performance (Taouab and Issor, 2019). Alosani *et al.* (2020) opined that performance is the evaluation of how well different organisational levels are doing in terms of accomplishing predefined goal. Taouab and Issor (2019) described performance as an organisation's ability to reach its potential or targets over time. Similarly, Oboreh and Arukaroha (2021) opined that performance is the organisation's ability to meet the desired result as determined by the firm's key shareholders. On the other hand, it is to ascertain whether the real output of a firm is as what has been targeted (Mikalef and Gupta, 2021).

Performance is the capacity of an organisation to achieve its mission through good management, solid governance, and a continuous commitment to achieving particular objectives over a predetermined period of time (Oboreh, 2020; Mikalef and Gupta, 2021). In today's fast-paced corporate contexts, a greater knowledge of the elements' influencing FP is becoming increasingly vital. Managers must identify effective ways to accomplish and exceed business performance goals in the face of increased competition, technological breakthroughs, and fast shifting demands from customers (Kostopoulos *et al.*, 2020).

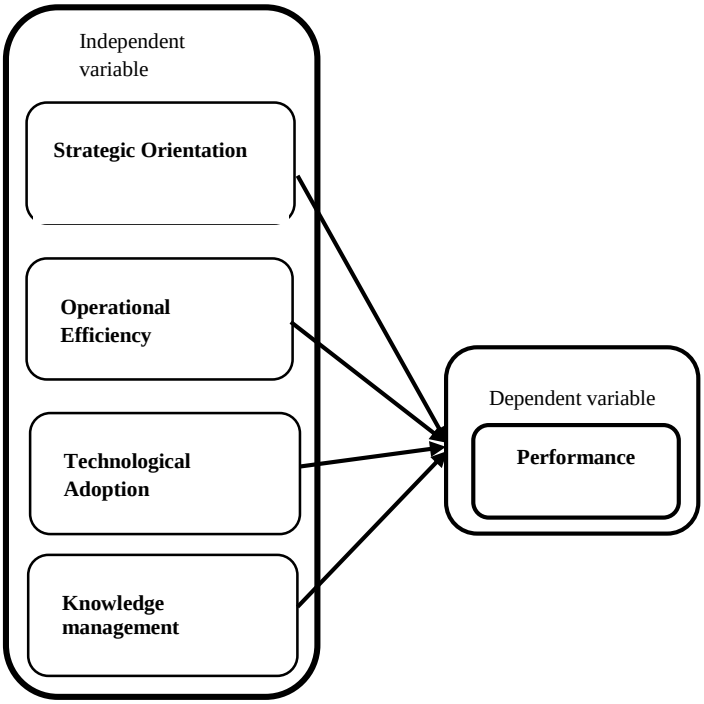


Figure 1: Conceptual framework

Theoretical Framework

The theory underpinning this study is the Dynamic capability theory (DCT) which was developed by David Teece an American Professor of organisational economist and Gary Pisano an American Professor of Economist in 1997 (Bleady *et al.*, 2018). The theory emerged as both an extension to and a reaction against the inability of the resource-based view (RBV) to interpret the development and redevelopment of resources and capabilities to address rapidly changing environments (Mwangi, 2023). The hypothesis states that "the firm's ability to integrate, build new business practices" Reconfiguring internal and external competencies to organise new workplaces and meet fast changing circumstances improves business performance (Bleady *et al.*, 2018). As markets arise, collide, divide, change, and perish, firms attain new resource configurations through organisational and strategic routines called Dynamic Capabilities (DCs).

DCT encourages businesses to continuously gather and analyse performance data, establish difficult and interrelated short- and long-term goals, reward high performers, and retrain/fire low performers. Teece (2007) proposes an elabourate paradigm with three components: sensing, seizing, and reconfiguring to define DCs in firms. He said sensing means organisations must be able to find opportunities in a fast-paced, competitive environment where consumer wants change. This requires companies to constantly scan, look for, and

study new business and industry trends. Sensing requires consumer demand and technical capability research (Damanpour, 2020). Once new business practices and market prospects are identified, organisations must capitalise. New products, processes, and services require development and commercialisation investments to seize the market (Ilmudeen *et al*., 2021). DCT's path-dependent processes will best fit rice processing firms' internal operations by creating, integrating, and reconfiguring their resource and capability portfolio to adapt to quickly changing environments (Samsudin and Ismail, 2019). This dimension is crucial and gives employees more decision-making power, which is another breakthrough in workplace organisation (Chen *et al*., 2020). DCT assumes an organisation's basic competencies should be leveraged to establish short-term competitive positions that can be turned into long-term competitive advantage (Bleady *et al*., 2018). DCT also implies firms must improve network capabilities to access new information and resources and innovate (Zahra *et al*., 2022). However, the theory has been heavily criticised for several reasons, including the term itself, difficulties in assessing the theory's conclusions (Samsudin and Ismail, 2019), difficulties in understanding DCs, and the lack of clear models to measure these capabilities and how they affect organisational performance.

Empirical Review

Zhang *et al*. (2020) explored the impact of strategic orientations and participation goals on technical standardisation, as well as how they interact with political relationships and technological disruption. The study used a quantitative research method and a survey technique to collect data from 320 Chinese manufacturing organisations. It found that both rivalry and technological orientations influence firms' inclinations to participate in standardisation. Competitive attitude weakens political relationships while creating technical turmoil. The impact of technological instability on a firm's willingness to engage in standardisation is likewise reduced.

Tian *et al*. (2022) examines the effects of utilizing blockchain technology on operational effectiveness, specifically in relation to cross-border trade between Yunnan Province, China, and Southeast Asian countries. By virtue of its immutability and traceability, the adoption of a platform based on blockchain technology effectively resolves numerous prevailing issues in cross-border trade. We conducted a field experiment to validate the impact of blockchain technology on the operational efficiency of enterprises engaged in cross-border trade. The findings indicate a significant savings in operational, agency, and time expenses. Utilizing blockchain technology decreases the need for intermediary organisations involved in cross-border commerce and settlement payments. It also enhances the speed of business operations and the effectiveness of interdepartmental business communication. This study offers novel perspectives on the intersection of blockchain technology and supply-chain operation management.

Tseng *et al*. (2023) examined the effects of implementing new technology on the operational efficiency of multinational corporations. Additionally, it examines whether the adoption of new technologies and investment in research and development (R&D) enhances a company's business performance. The research sample comprises organisations listed in the US Fortune 500 and China Fortune 500 rankings spanning the years 2012 to 2019. The research findings indicate that the size of corporate assets and investment in research and development (R&D) play a significant role in driving the adoption of blockchain technology. Specifically, larger companies in the United States (but not in China) tend to adopt blockchain technology. Furthermore, the study reveals that enterprises' investment in innovation and their adoption of blockchain technology contribute to enhancing corporate business performance. Additionally, it is observed that the improvement in operating performance among US companies utilizing blockchain technology is greater compared to Chinese enterprises.

Martínez-Falcó *et al*. (2024) examine the impact of Knowledge Management (KM) on Sustainable Performance (SP) within the wine sector. The study specifically examines the influence of KM on SP, with a focus on the mediating role of GI and the moderating role of CC. The study presents a theoretical framework that builds upon prior research and is validated using structural equation modeling (PLS-SEM) with data obtained from 202 vineyards in Spain. The research findings suggest that there is a favorable correlation between KM (knowledge management) and SP (strategic performance), with GI (group interaction) acting as a mediator and CC (communication climate) playing a moderating role in this connection. The research is unique for two reasons. Firstly, there have been no previous studies that have examined the relationship between knowledge management and strategic planning in the wine industry. Secondly, there is no existing academic literature that has utilized the CC variable to moderate the primary relationship being investigated.

METHODOLOGY

The research design for this study is a cross-sectional survey design that utilises a quantitative technique. This approach will enable the researcher to collect information from a significant number of rice processing firms in North-Central Nigeria using a closed-ended questionnaire. This study utilises a multi-stage sampling technique to select a sample size of 384 employees from a population of 9,035. The sampling method is based on a simplified version of Slovin's Formula modified by Tania *et al*. (2022). The sample was obtained with a 95 percent confidence level and a 5 percent error of precision level (1967). The data was collected by an online survey that utilised a 5-point Likert scale, which ranged from strongly disagree to strongly agree. During the process of operationalisation, the dependent and independent variables are expressed in mathematical terms. The independent variable in this context is Innovation in Business practices (IBP), while the dependent variable is performance (P).

The model is represented by:

$$P_{it} = \beta 0 + \beta 1\ SO_{it} + \beta 2\ OE_{it} + \beta 2\ KM_{it} + \mu_{it}$$

Where:

P = Performance

SO = Strategic orientation

OE = Operational efficiency

KM= Knowledge management

β_0 = Intercept

$\beta_{1\text{-}2}$ = Regression Coefficients

μ = The error term.

The data obtained are analysed with regression statistics using SPSS 5% level of significance, if the estimated t-value is equal or greater > than table (critical) t-value, we reject Null and accept alternate hypothesis

Results and Discussion

The Demographics showing the gender, Age, educational qualification, and position in organisation are presented in Figure 1 below.

Table 1: Demographic Compositions of Rice Processing Firm Respondents

Items	Frequency	(%)
Gender		
Male	365	74.30
Female	126	25.70
Total	**491**	**100**
Age		
18 – 24	130	26.50
25 –31	180	36.70
32 – 38	74	15.10
39 – 45	72	14.70
46 and above	35	7.10
Total	**491**	**100**
Educational Qualification		
Postgraduate	47	9.60
Degree	129	26.3
Diploma	198	40.30
Primary/Secondary	117	23.80
Total	**491**	**100**
Position in company		
Management team	46	9.40
Supervisor	43	8.80
Junior Staff	382	77.80
Other rank	20	4.10
Total	**491**	**100.00**

The table below summarizes the findings from the variable correlation analyses. This practice achieves two critical aims. The first step is to determine whether there is a bivariate relationship between each pair of dependent and independent variables. The second stage is to ensure that the correlations between the explanatory variables are not so strong as to produce multicollinearity issues.

Table 2: Correlation coefficient

		SO	OP	KM	TA	P
SO	Pearson Correlation	1	.530**	.533**	.525**	.525**
	Sig. (2-tailed)		.000	.000	.000	.000
	N		491	491	491	491
OP	Pearson Correlation		1	.542**	.452**	.452**
	Sig. (2-tailed)			.000	.000	.000
	N			491	491	491
KM	Pearson Correlation			1	.604**	.604**
	Sig. (2-tailed)				.000	.000
	N				491	491

P	Pearson Correlation			1
	Sig. (2-tailed)			
	N			

Correlation is significant at the 0.01 level (2-tailed).

Table 2 above shows the correlation coefficients between the respective variables all of which have values that are less than 0.9 and greater than 0.1. This indicates that the variables correlate fairly enough to be used for the study and there is no chance of harmful multicollinearity. In addition, using Variance Inflation Factor (VIF) to test for multicollinearity, Kothari and Garg, (2014) stated that a VIF figure greater or equals 10 shows serious multicollinearity. However, in this study, there was no problem of multicollinearity as all VIF figure in Table 3 below.

Table 3: Variance Inflation Factor

Model		**Collinearity Statistics**	
		Tolerance	VIF
1	(Constant)		
	SO.	.596	1.677
	OE.	.624	1.602
	KM	.553	1.808

a. Dependent Variable: P

The assumption of no autocorrelation of the error terms is also a requirement of linear regression. Norusis (1995) is of the opinion that Durbin-Watson can be used to test the independence of error terms. He added that the general rule of thumb is that if the Durbin-Watson value is between 1.5 and 2.5, the assumption of independence of the terms is not violated. The Durbin Watson coefficient stood at 1.91 as shown in Table 4 which falls within the benchmark. This indicates the absence of harmful serial correlation. This fulfils one of the assumptions of linear regression.

Table 4: Hypotheses Testing

Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	3.969	.194		20.318	.000
	SO	-.097	.058	-.197	-1.669	.096
	OE	.084	.049	.098	1.732	.084
	KM	-.073	.053	-.084	-1.388	.166
R						.139
R Squared						.019
Adjusted R Square						.011
F-Statistics						2.383
Probability (F-Stat)						.59607
Durbin-Watson						1.174

a. Dependent Variable: P
b. Predictors: (Constant), TA, OP, SO, KM

Table 4 presents the ANOVA for the effect of Innovation in Business practices (IBP) on the performance of rice processing firms. The F-statistics stood at 2.383. The p-value is less than 0.05, indicating that the relationship depicted in the model is significant at a 95% confidence level. Also, the value of R as depicted in the model indicates a positive and low (0.139) indicating a strong relationship between the combined variables of innovation in business practices and the performance of rice processing firms. The value of the R square (0.019) implies that the independent variables account for about 1.9% variation in the performance of rice processing firms. The value of the adjusted R square (0.011) implies that the independent variables will still account for about 1.1% variation in the performance of rice processing firms if exogenous variables are added. The study findings concur with previous findings by Lee *et al.* (2019), and Susanty *et*

al., (2021) which reported that there is a strong relationship between IBP and the performance of rice processing firms**.**

The coefficient of Strategic orientation stood at -0.197 which is negative implies that the more Strategic orientation are flexible the less the performance by 1.9%. However, the significance of this can be judged from the *t* statistics and its significance which stood at -1.669 having a p-value of 0.783. The p-value is greater than 0.05, indicating that the relationship depicted in the model is insignificant at a 95% confidence level. This implies that the study has no statistical evidence to reject the null hypothesis which states that- Strategic orientation has no significant effect on the performance of rice processing firms in Niger State, Nigeria. The result is however unexpected because it is believed that the more innovative strategic decisions of an organisation is, the better the performance. The findings disagree with the previous studies of Nugroho *et al.*, (2022) and Markin *et al.*, (2022). Rizan et al. (2019) stated that strategic orientation have positive and significant effects on a firm's performance while Han and Niu, (2023) reported that organisation's decision-making style, method, and technique of operation are all reflected in its strategic orientation. Based on how it responds to and reshapes the actual environment, the enterprise chooses a strategic orientation to attain high performance.

Furthermore, the study also reveals that the coefficient of Operational efficiency (OE) stood at 0.084 which is high and positive and implies that an increase in Operational efficiency would lead to an increase in the performance of rice processing firms by 8.4%. However, the significance of this can be judged from the *t* statistics and significance. The *t* statistics of Operational efficiency stood at 1.732 with a p-value of 0.166. The p-value is greater than 0.05, indicating that the relationship depicted in the model is significant at a 95% confidence level. This implies that the study has enough statistical evidence to accept the null hypothesis which states that Operational efficiency has significant impact on the performance of rice processing, hence Operational efficiency has a significant effect on the performance of rice processing firms in Niger State, Nigeria. This result is in sync with Tian *et al*., (2024), who opined that firms with higher levels of operational efficiency are more likely to achieve economies of scale, lower per-unit costs, and improve their market competitiveness. This result also matched with the findings of Notteboom *et al*., (2023), in their findings they affirmed that firms that invest in process optimization tools and methodologies frequently see improved operational performance and profitability.

The coefficient of knowledge management (KM) stood at -0.084, indicating that the more flexible knowledge management, the lower the performance by 1.8%. However, the significance of this may be determined using the t statistic and its significance, which was -1.388 with a p-value of 0.166. The p-value is more than 0.05, indicating that the link indicated in the model is statistically insignificant at the 95% confidence level. This suggests that the study lacks statistical evidence to reject the null hypothesis, which claims that knowledge management has no significant effect on the performance of rice processing enterprises. The outcome is surprising because it is assumed that strong knowledge management methods are more likely to provide higher levels of operational efficiency and performance. The findings contradict previous research by Sayyadi (2019) and Delshab et al. (2022), who defined KM as the creation and application of experience, knowledge, and expertise that leads to the development of new capabilities, improves performance, fosters innovation, and increases the value of a product or service to the customer.

Conclusion and Recommendations

The study examined the effect of innovation in Business practice on the performance of rice processing firms in Niger State, Nigeria, focusing on strategic orientation, operational efficiency, and Knowledge management. The findings revealed a significant and strong relationship between innovation in business practices and the performance of rice processing firms in Niger State, Nigeria, as indicated by the R value (0.139) and the R square value (0.019). However, strategic orientation and knowledge management was found to have an insignificant and negative effect on rice processing firms, suggesting that increased in strategic orientation does not necessarily enhance performance. Conversely, operational efficiency demonstrated a significant positive effect, with a high coefficient (0.098), indicating that effective operational efficiency can substantially boost rice processing firms' success. These findings highlight the critical role of operational efficiency in driving performance, while also challenging assumptions regarding the benefits of strategic orientation and knowledge management. The results suggest that while IBP has the potential to revolutionize rice processing, the way it is managed is crucial to realizing its benefits. The study thus recommends that:

i. Given the unexpected unfavorable impact, rice processing firms in Niger should pursue a balanced strategic orientation. This includes assuring compatibility with existing systems

while avoiding overemphasizing flexibility, which can lead to inefficiencies.

ii. The management of rice processing firms should give particular attention to the development of operational efficiency within the firm, hence Process optimization lead to continuously assessing and improving manufacturing processes to increase productivity and lower costs.

iii. Rice processors in Niger Nigeria should prioritise innovative workplaces and management. Effective training and development, knowledge production, and application among staff are required. Management should promote brainstorming and knowledge sharing in a welcoming workplace to boost performance. A supportive organisation and management style can change employee behaviour and foster innovation.

References:

Afandi, N. M., & Lee, K. L. (2023). Improving the Quality of Paddy and Pricing Issues through Process Optimization in A Rice Company. *International Journal of Industrial Management*, *17*(4), 195-209. DOI: https://doi.org/10.15282/ijim.17.4.2023.10049

Ahmad, F., Widén, G., & Huvila, I. (2020). The impact of workplace information literacy on organisational innovation: An empirical study. *International Journal of Information Management*, *51*, 102041. https://doi.org/10.1016/j.ijinfomgt.2019.102041

Alosani, M. S., Yusoff, R., & Al-Dhaafri, H. (2020).The effect of innovation and strategic planning on enhancing organisational performance of Dubai Police. *Innovation & Management Review*, *17*(1), 2-24.

Aloulou, W. J. (2019). Impacts of strategic orientations on new product development and firm performances: Insights from Saudi industrial firms. *European Journal of Innovation Management*, *22*(2), 257-280.

Anees-ur-Rehman, M., & Johnston, W. J. (2019). How multiple strategic orientations impact brand equity of B2B SMEs. *Journal of Strategic Marketing*, *27*(8), 730-750.

Anzola-Román, P., Bayona-Sáez, C., & García-Marco, T. (2018). Organisational innovation, internal R&D and externally sourced innovation practices: Effects on technological innovation outcomes. *Journal of Business Research*, *91*, 233-247.

Azeem, M., Ahmed, M., Haider, S., & Sajjad, M. (2021).Expanding competitive advantage through organisational culture, knowledge sharing and organisational innovation.*Technology in Society*, *66*, 101635.

Beliaeva, T., Shirokova, G., Wales, W., & Gafforova, E. (2020). Benefiting from economic crisis? Strategic orientation effects, trade-offs, and configurations with resource availability on SME performance. *International Entrepreneurship and Management Journal*, *16*, 165-194.

Bibi, S., Khan, A., Qian, H., Garavelli, A. C., Natalicchio, A., &Capolupo, P. (2020). Innovative climate, a determinant of competitiveness and business performance in Chinese law firms: the role of firm size and age. *Sustainability*, *12*(12), 4948.

Bleady, A., Ali, A. H., & Ibrahim, S. B. (2018). Dynamic capabilities theory: pinning down a shifting concept. *Academy of Accounting and Financial Studies Journal*, *22*(2), 1-16.

Bos-Nehles, A. C., &Veenendaal, A. A. (2019). Perceptions of HR practices and innovative work behavior: the moderating effect of an innovative climate. *The International Journal of Human Resource Management*, *30*(18), 2661-2683.

Chen, Q., Wang, C. H., & Huang, S. Z. (2020). Effects of organisational innovation and technological innovation capabilities on firm performance: evidence from firms in China's Pearl River Delta. *Asia Pacific Business Review*, *26*(1), 72-96.

Corsi, C., Prencipe, A., &Capriotti, A. (2019).Linking organisational innovation, firm growth and firm size. *Management Research: Journal of the Iberoamerican Academy of Management*, *17*(1), 24-49.

Damanpour, F. (2020).*Organisational innovation: Theory, research, and direction*. Edward Elgar Publishing.

D'angelo, A., and Presutti, M. (2019). SMEs international growth: the moderating role of experience on entrepreneurial and learning orientations. *Int. Bus. Rev.* 28, 613–624.

Duke, J., Igwe, V., Tapang, A., & Usang, O. (2023). The innovation interface between knowledge management and firm performance. *Knowledge Management Research & Practice*, *21*(3), 486-498.

Dukeov, I. (2022). On antecedents of organisational innovation: how the organisational learning, age and size of a firm impact its organisational innovation. *Lutpub.lut*, 1-247 Retrieved from https://lutpub.lut.fi/handle/10024/163842

Fernando, Y., Jabbour, C. J. C., & Wah, W. X. (2019). Pursuing green growth in technology firms through the connections between

environmental innovation and sustainable business performance: does service capability matter? *Resources, Conservation and Recycling*, *141*, 8-20.

Guerreiro, M. S. M. (2022). *Work organisation, innovation, and firm performance* (Doctoral dissertation). Retrieved form https://repositorium.sdum.uminho.pt/bitstream/1822/79120/1/

Hameed, W. U., & Naveed, F. (2019). Coopetition-based open-innovation and innovation performance: Role of trust and dependency evidence from Malaysian high-tech SMEs. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *13*(1), 209-230

Ilmudeen, A., Bao, Y., Alharbi, I. M., & Zubair, N. (2021). Revisiting dynamic capability for organisations' innovation types: Does it matter for organisational performance in China?. *European Journal of Innovation Management*, *24*(2), 507-532.

Kapalata, D., & Sakurai, T. (2020). Adoption of quality-improving rice milling technologies and its impacts on millers' performance in Morogoro region, Tanzania. *Japanese Journal of Agricultural Economics*, *22*, 101-105.

Kostopoulos, K., Mammassis, C., & Papalexandris, A. (2020). A systematic literature review of organisational innovation: exploration, exploitation, and ambidexterity through a multilevel lens. *Exploitation, and Ambidexterity through a Multilevel Lens (July 14, 2020)*.

Martínez-Falcó, J., Marco-Lajara, B., Zaragoza-Sáez, P., & Sánchez-García, E. (2024). The effect of knowledge management on sustainable performance: evidence from the Spanish wine industry. *Knowledge Management Research & Practice*, *22*(3), 298-313.

Markin, E. T., Swab, R. G., Gigliotti, R., Nicol, C. D., Jia, Y., & Mukherjee, K. (2022). Benchmarking strategic orientation and firm performance: An analysis of entrepreneurial orientation dimensions. *Multidisciplinary Business Review*, *15*(2), 65-77.

Mikalef, P., & Gupta, M. (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organisational creativity and firm performance. *Information & Management*, *58*(3), 103434.

Mpuon, J. A., Odigbo, B. E., Etim, G. S., Etuk, I. U., & Usoro, A. A. (2023). Impact of system integration of automation and autonomation supply chain strategies in operational performance of manufacturing firms. *International Journal of Value Chain Management*, *14*(2), 195-219.

Mwangi, J. W. (2023). Waithaka. P.(2023). Intangible organisational resources and performance of road construction companies in Nyeri County, Kenya. *International Academic Journal of Human Resource and Business Administration*, *4*(3), 38-60.

Notteboom, T., Satta, G., Persico, L., Vottero, B., & Rossi, A. (2023). Operational productivity and financial performance of pure transhipment hubs versus gateway terminals: An empirical investigation on Italian container ports. *Research in Transportation Business & Management*, *47*, 100967.

Nugroho, A., Prijadi, R., & Kusumastuti, R. D. (2022). Strategic orientations and firm performance: the role of information technology adoption capability. *Journal of Strategy and Management*, *15*(4), 691-717.

Obianefo, C. A., Ezeano, I. C., Isibor, C. A., & Ahaneku, C. E. (2023).Technology Gap Efficiency of Small-Scale Rice Processors in Anambra State, Nigeria. *Sustainability*, *15*(6), 4840.

Oboreh, L. E. (2020). Organisational culture and firm performance in selected multinational companies in South-South Nigeria. *International Journal of Business & Law Research*, *8*(4), 46-58.

Oboreh, L. E., & Arukaroha, J. (2021). Reward Management And Organisational Performance: A Study Of Universities In Edo State. *International Journal Of Innovative Social Sciences & Humanities Research 9(2):96-104*

Ode, E., &Ayavoo, R. (2020).The mediating role of knowledge application in the relationship between knowledge management practices and firm innovation.*Journal of Innovation & Knowledge*, *5*(3), 210-218.

Ogwuike, P. C. A., Ogwuike, C. O., & Arouna, A. (2022). Impact of the adoption of technological innovation on the credit acquisition of rice farmers in Senegal: A propensity score matching technique. *African Journal of Science, Technology, Innovation and Development*, *14*(2), 478-488.

Rizan, M., Balfas, F., & Purwohedi, U. (2019).The influence of strategic orientation, organisational innovation capabilities and strategic planning on the performance of technology-based firms. *Academy of Strategic Management Journal*, *18*(3), 1-11.

Samsudin, Z., & Ismail, M. D. (2019).The concept of theory of dynamic capabilities in changing environment. *International Journal of Academic Research in Business and Social Sciences*, *9*(6), 1071-1078.

Schumpeter, J. A., & Swedberg, R. (2021). *The theory of economic development*. Routledge. https://doi.org/10.4324/9781003146766

Schweiger, S. A., Stettler, T. R., Baldauf, A., & Zamudio, C. (2019). The complementarity of strategic orientations: A meta-analytic synthesis and theory extension. *Strategic Management Journal*, *40*(11), 1822-1851.

Shehadeh, M., Atta, A., Barrak, T., Lutfi, A., & Alrawad, M. (2024). Digital transformation: An empirical analysis of operational efficiency, customer experience, and competitive advantage in Jordanian Islamic banks. *Uncertain Supply Chain Management*, *12*(2), 695-708.

Snihur, Y., & Wiklund, J. (2019).Searching for innovation: Product, process, and business model innovations and search behavior in established firms.*Long Range Planning*, *52*(3), 305-3

Susanty, A., Sumiyati, L. S., Syaiful, S., & Nihlah, Z. (2021). The impact of lean manufacturing practices on operational and business performances at SMES in the wooden furniture industry. *International Journal of Lean Six Sigma*, *13*(1), 203-231.

Taouab, O., & Issor, Z. (2019). Firm performance: Definition and measurement models. *European Scientific Journal*, *15*(1), 93-106.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, *28*(13), 1319-1350.

Tian, X., Zhu, J., Zhao, X., & Wu, J. (2024). Improving operational efficiency through blockchain: evidence from a field experiment in cross-border trade. *Production Planning & Control*, *35*(9), 1009-1024.

Tie, X. Y., An, N. N., Li, D., Wang, L. J., & Wang, Y. (2023). Recent Advances in Rice Milling Technology: Effect on Nutrient, Physical Properties and Digestibility. *Food Reviews International*, 1-27.

Tseng, F. M., Liang, C. W., & Nguyen, N. B. (2023). Blockchain technology adoption and business performance in large enterprises: A comparison of the United States and China. *Technology in Society*, *73*, 102230.

Vaezinejad, S., & Schniederjans, D. (2024). Lean supply chain 5.0 management (LSCM 5.0): lean and value reconceptualized. In *The Palgrave Handbook of Supply Chain Management* (pp. 419-441). Cham: Springer International Publishing.

Volberda, H. W., Khanagha, S., Baden-Fuller, C., Mihalache, O. R., &Birkinshaw, J. (2021). Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines and introducing new organisational forms.*Long Range Planning*, *54*(5), 102110.

Zahra, S. A., Petricevic, O., & Luo, Y. (2022). Toward an action-based view of dynamic capabilities for international business. *Journal of International Business Studies*, 1-18.

Zhang, Y., Liu, J., & Sheng, S. (2020). Strategic orientations and participation intentions for technical standardisation. *Technology Analysis & Strategic Management*, *32*(8), 881-894.

Zhao, S., Jiang, Y., Peng, X., & Hong, J. (2021). Knowledge sharing direction and innovation performance in organisations: do absorptive capacity and individual creativity matter?. *European Journal of Innovation Management*, *24*(2), 371-394.

