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Editorial

This edition of NIU *Journal of Social Sciences* focuses on Development Administration and Social Psychology.

The first part of the Journal addresses issues in Development Administration such as International Debt Management, Government Entrepreneurial Policies, Primary Healthcare and other Public Welfare Services. It is argued in one of the papers that despite the goals of Government Entrepreneurial Policies to enhance financial resources and access to the market, the effectiveness of these policies has been limited. Major problems include insufficient access to capital, value-restrictive cultural norms, and inadequate program support. It is therefore suggested that entrepreneurial policies should be designed to meet the needs of Indigenous women entrepreneurs, improve access to financial resources, expand training opportunities, and address cultural barriers in the studied area.

Papers in the second part are on Social Psychology. It is revealed in one of the papers in this section that some advertisements portrayed women in an inferior context and showed that the advertisements capable of impacting negatively on the image of women in the workplace. Other findings showed female workers disagreeing to stereotypes in the selected advertisement affecting their personality while the audience generally perceived highly that female stereotypes can hamper managerial opportunities and positions for women. Hence, the study recommends that women should see themselves as talented individuals with unique skills, who can manage their affairs in the world with dignity and decorum.

Readers are advised to make proper use of the ideas presented by the various authors in this issue of *NIU Journal of Social Sciences*. Some of these papers are empirical in nature while others have theoretical base. Each of them focuses on one specific social and management problem or the other; trying to proffer solutions to them.

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Part One

Development Administration



The Challenge of Rapid Development Amidst International Debt in Sub-Saharan Africa: Nigeria's Legal Framework and Pathways to Sustainable Debt Management

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Abstract. Africa is no longer the frontier for new expansion like before the colonial era when Developed nations carved the African continent like a nice piece of chocolate cake. Anyone who still thinks this way does not fully grasp the implications of debt dealing and the mouse trap of international borrowing and underdevelopment. Africa is still the major frontier for European and oriental expansion but this time rather than sending troops on the ground the battle is economic. The struggle is also philanthropically disguised in initiatives by international financial and non-financial organizations that are loyal to the developed nations. This work is not a debate as to the veracity of the claims made here rather this work is squarely focused on the challenge of Nigerian external debt in recent times. The voyage is designed to examine the legal framework over external debt management in Nigeria while seeking adaptable solutions that would end the culture of international borrowing and make sure there are real economic gains made viz a viz the culture of running abroad for loans for capital projects. Borrowing for Nigeria predated the existence of the Nigerian democracy because at the time when the earliest international loans were taken, the Brits were still in control around 1958, and the sum of Twenty-Eight Million (\$28 Million) was obtained to ensure the construction of the Nigerian railway system. The research shows that indeed there are a handful of legislations within the country that regulate and marshal out both the powers and parameters of securing and servicing external debt, however, there is a disconnect somewhere that leads to many hindrances on the growth of the nation's GDP. It is the objective here to through the examination of

existing laws discover the missing link and make recommendations for better arrangements. Invariably there will be lessons from looking at the legal framework vis-a-vis the sub-Saharan African layout. Indeed, developing economies must now focus within and desire more alternatives for raising capital than simply relying on foreign debt or international debt or external debt to raise capital for infrastructural projects within the nation or for even running the government.

Keywords: International debt, Debt servicing, Financing, Debt Refinancing, Nigerian, World Bank.

1. Introduction

A debt profile is the outline or description of the total debt owed by individuals, companies, or the government (Abdulmumini, Ewugi, & Gomina, 2022). In this particular instance, we are dealing with the debt profile of whole nations specifically the debt profile of the Nigerian government. The most reliable source for information at the national level may easily be the Nigerian Bureau of Statistics (NBS) though one cannot without a shadow of a doubt vouch for the absolute credibility of the records from NBS, the attempt at capturing national figures is commendable (Antai et al., 2024; Aidonojie et al., 2021; Aidonojie et al., 2020). Accordingly, stats from the Bureau regarding States and Federal Debt showed using Stock data as of 30th September 2020 that the Country's total public debt portfolio stood at ₦32.22 trillion naira currently (National Bureau of Statistics, 2020). This is now four years ago and there have been more foreign debts incurred by the President Muhammadu Buhari-

led government and the most recent loan from the World Bank from the President Asiwaju Bola Ahmed Tinubu Government (Aina, 2024). A cursory look at about twenty years ago stat shows that in the year 2004 Nigeria's external debt stood at \$35.94 billion United States dollars, having shut up astronomically from US\$18.9 billion United States dollars recorded in 1985 (Omotosho, Bawa & Doguwa, 2016). Presently the nations' calculated public debt showed that ₦12.19 trillion naira or 37.82% of the debt was purely externally obtained by the Nigerian Government with ₦20.04 trillion naira or 62.18% (Omotosho, Bawa & Doguwa, 2016) of the debt being sourced from homegrown sources or being domestic loans. These numbers have since doubled. A further look and disaggregation of Nigeria's foreign debt showed that \$16.74 billion of the debt was multilateral (consisting of international creditors such as major international financiers like the World Bank and IMF etc.) while about 502.38 million dollars was bilateral (as between Nigeria and another sovereign nation) and another \$3.26 billion bilateral from China's Export and Import Bank, India, and Germany while 11.17 billion dollar was commercially represented in the form of Eurobonds and other kinds of Bonds (Omotosho et al., 2016; Masajuwa & Aidonojie, 2020) and incorporeal asset (Paul & et al, 2024). While the statistics reveal the status quo and problem it is important to zero in on the laws that regulate external debt and create the necessary powers and pathways for approval (Antai, 2024; Imoisi et al., 2023; Oaihimore & Aidonojie, 2023).

That Nigeria occupies a very important position economically in the African Continent (Antai, 2024) is not in dispute, it is often viewed as being the most populous African nation but despite her capacity and might she remain underdeveloped and classed as a developing economy denied many privileges as a result; despite the wealth of the nation (Ekpenisi, & et al., 2024). It is difficult to really trace the exact foreign loan that would be described as Nigeria's first international loan prior to the period of colonialism. However, one of Nigeria's earliest external debt or loan was obtained from the Italian Government as far back as 1964 (Akanbi, Uwaleye, Ibrahim, 2002). The sum is reported to have been about thirteen Million and One Hundred Thousand Dollars (\$13.1 Million) to build the Niger Dam to facilitate immigration and drainage in the Northern region of the country (Akanbi, Uwaleye, Ibrahim, 2002). Since that time the habit has been formed and it is now almost certain that every government lives on borrowed money to survive, money specifically taken from foreign residents or institutions. As recently as days ago the World Bank approved the sum of 2.25 billion dollars

to be advanced to Nigeria with 1.5 billion dollars out of this largesse meant for reforms for economic stabilization to enable transformation development policy financing program while 750 million dollars set aside for accelerating resource mobilization reforms program (Omotosho, Bawa & Doguwa, 2016). The loan is committed with so much optimism as intended to enhance non-oil revenue and promote fiscal sustainability among other things but how disciplined can the Nigerian government be to ensure it is not just another round of loans that would be wasted or siphoned elsewhere (Majekodunmi et al., 2024)? Can the existing laws made by the National Assembly on debt management help in avoiding this particular sum being wasted? That forms the purport of this inquiry (Aidonojie et al., 2024; Budiyanto et al., 2024). The research is stratified into sections with the very first part dealing with the debt debacle of African Nations in the 21st Century; the second part considers Nigerian legislation over external debt management beginning with the Constitution of the Federal Republic of Nigeria 1999 (as amended) (Aidonojie, 2023; Aidonojie et al., 2022); then the final part deals with implications and possible lessons for Nigeria and other African nations.

2. The Debt Debacle and Sub-Saharan African Nations in the 21st Century

From basic economic enlightenment, it is assumed that debt is a burden and should be avoided at all cost, but national governments seem not to get the memo. Perhaps it is a necessary evil that is needed for much greater good later on. Who knows? The sustainable development and economic prosperity of beloved black Africa is important and should be at the zenith of any conversation. The term sub-Saharan Africa is often used to describe some parts of Africa and not all of Africa, the concern of this inquiry is specifically around the fringes of this area so described with an even more precise look at Nigeria (Aidonojie et al., 2022; Aidonojie & Francis, 2022). The New World Encyclopedia (2024) which provides many definitions and explanations on key subjects, define the term 'sub-Saharan Africa' to mean that specified region or area of the African continent geographically situated south side of the famous Sahara Desert. For even more precision it is recorded that the demarcation line which divides the sub-Saharan part of Africa from North Africa is the Southern edge line of the Sahara Desert (New World Encyclopedia, 2024). The word 'sub' taken in another breadth means below' this by implication sub-Saharan African Countries are countries below the Southern edge line of the Sahara Desert. Precisely, countries in West Africa, and although traveling farther other parts such as Central

Africa, East Africa, and Southern Africa, including unsurprisingly the horn of Africa are all part of the larger description of sub-Saharan Africa. These countries are all undeveloped or developing as the case may be.

The Sub-Saharan African nations are all one way or the other debt merchants for one reason or the other. Who is their highest creditor? Although there are rumours it is China, verifiable data shows that the United Kingdom ranks as one of the highest creditors to Sub-Saharan African nations (Akpanke, et al., 2022) and this is not very surprising considering the historical affiliations with the sub-continent. As of 31 August 2022, developing countries in Africa reportedly owed a total of £2,758, 000.00 million (Two Million Seven Hundred and Fifty-Eight Thousand Pounds) to the UK Government (World Bank, 2023). This figure quantitatively accounts for about 56% of all debt owed to the UK Government by foreign countries (Brooke-Holland & et al, 2023). This challenge could be described as debt distress which we choose to call the debt debacle. The nine (9) countries in debt distress or debt debacle currently are the Republic of Congo, Ghana, Malawi, Mozambique, Sao Tome and Principe, Somalia, Sudan, Zambia and Zimbabwe.

The debt debacle is the continuous cycle of debt dealing and borrowing that does not seem to translate to much feasible national growth (Haruna, Aidonjje, & Beida, 2024). The cycle never ends and the sub-Saharan African nations continue to shrivel down the barrel of economic advancement rather than upwards. The capital question then is how can this cycle be broken? I'm facing the issues this paper has been subdivided into four parts outside the introduction and conclusion with the last part addressing lessons for Nigeria and sub-Saharan African nations largely classed as developing nations (Aidonjje et al., 2023; Aidonjje et al., 2023). The second part focuses on the effect of external debt in terms of the burden it places on economic growth; the third part covers international arrangements to ease the burden while the fourth part deals with lessons for Nigeria as mentioned above being the concluding part of the research. The modus operandi adopted here is to deal with issues head-on rather than regurgitate what is already well-known in the area of international debt servicing. Senadza et al. (2017) assert that considering the immense gap and needs in Sub-Saharan African nations, there will continue to be an over-reliance on foreign financing and loans (Senadza, Korsi & Quartey, 2017). Here is the problem for sub-Saharan African nations and developing nations; continuous external loans mean growing debt to Gross Domestic

Product (GDP) ratio which would in turn erode any fading investors' confidence in the economy. Immediately foreign investors perceive the unsustainability of the accumulation of debt by the government the chances of more Foreign Direct Investment (FDI) are reduced drastically (Kose, Ohansorge & Sugawara, 2020). While sub-Saharan African nations seem to be trapped in an unending cycle of debt burden and negative economic and fiscal growth, the Latin American Nations have also had their fair share of trouble being developing nations (Shadlen, 2007).

3. The National Legal Framework over External Debt Management in Nigeria

We have reviewed the statistics from the Nigerian Bureau of Statistics (NBS) above but underlying all the statistics and occurrences at the heart of the matter are the laws and policies driving this culture of borrowing from external sources (Muwaffiq et al., 2024; Ekpenisi et al., 2024). At this point, it may be impossible to stop the trend but caution can be taken if the existing laws are obeyed and practised sincerely. In no particular order, we shall review the most relevant laws in Nigeria that make up the legal framework for authorizing external debt and managing the same (Edet, Antai & Itafu, 2022). In the same vein, it is important to consider the Constitution of Nigeria and see if there's an authoritative provision on the issue at hand. The authority document is the constitution which allows laws to be made both by the Federal legislature known as the National Assembly and by the States through the States' Houses of Assembly. In this part, it is considered better to examine the federal laws on debt management since any state laws would be too limiting governing only those states and their inhabitants (Mutawalli et al., 2024; Imoisi & Aidonjje, 2023). It will however be important to first consider the Constitution of the Federal Republic of Nigeria to see the permissibility of external borrowing or powers allotted for that.

4. The Constitution of the Federal Republic of Nigeria 1999 (as amended 2018)

The most potent provision to look to is section 81 (1) of the Constitution (hereinafter CFRN) which provides inter alia that whoever the President is or Commander in chief of the nation's economy, that President shall cause to be prepared and laid before each House of the National Assembly at any time in each financial year estimates of the revenues and expenditure of the Federation for the next following financial year. This is the appropriate stage to inform the legislature of any intentions to apply for loans and

provide adequate information for them to form an informed opinion. Interestingly, section 81 subsection (2) instructs that the heads of expenditure contained in the estimates (other than expenditure charged upon the Consolidated Revenue Fund of the Federation by this Constitution) shall be included in a bill, to be known as an Appropriation Bill, providing for the issue from the Consolidated Revenue Fund of the sums necessary to meet that expenditure and the appropriation of those sums for the purposes specified therein (Safi' et al., 2024). At the point of appropriation is the most ideal time to make the application for approval of a loan but this does not rule out the fact that there may be contingencies and unforeseen events also.

The Constitution is the collective will of the people, but the Nigerian Constitution 1999 (as amended) makes no explicit provision about external debt but it creates the powers to do so by implication (Mukhlis et al., 2024). The constitution of the Federal Republic of Nigeria 1999 (as amended) has seen all borrowing of money within or outside Nigeria for the Federation or of any State put within the exclusive legislative list in the second schedule to the Constitution. The implication therefore is that it is only the National Legislature that can approve any external loans for the government (Edetalehn & Aidonojie, 2023). As for state governments that take loans outside the shores of the state, the state Assembly must approve the same. The CFRN therefore allows and envisages borrowing externally. As if this is not enough confirmation item 50 of the Exclusive legislative list in the second schedule specifically lists the public debt of the federation as being within the exclusive preserve of the Federal Legislature to legislate on (Gunawan et al., 2023; Aidonojie et al., 2023). In recent times there has hardly been any opposition to foreign loans by the national assembly for a host of reasons. Perhaps the legislators feel like no need to oppose what seems to be good for the economy. The CFRN only provides the authority regarding approval while the following laws to be reviewed go a notch further.

The Loans Act (1960)

The preamble reveals the purpose of the Act as authorising the raising of loans outside Nigeria. The Act which by now has been taken over by events had pegged the external loan limits to not exceeding N80, 000, 000.00 (eighty million naira) for specific purposes in connection with the economic programmes and development programmes of the government of the Federation and of other governments in Nigeria and with certain statutory corporations. Although this legislation came in the year of Nigeria's Independence, repealing an older

Loans Act of 1954 was probably its greatest accomplishments. The external borrowing threshold under this legislation is eighty million naira however as expected with the inflation rates this amount has risen. The authority to raise loan is provided for specifically in section 31, it is the finance minister that is saddled with this responsibility. This Act also is one that has been revised repeatedly and is now out of circulation having been replaced by more recent legislations.

5. The Fiscal Responsibility Act (2007)

With the clear roles which define government structure and economy, the Fiscal Responsibility Act (FRA) was promulgated with the specific goal of promoting prudent management of the nation's resources. The FRA aims to limit waste and ensure long-term macroeconomic stability, fostering a culture of accountability within the national economy. The Act also sets out to secure greater accountability and transparency in fiscal operations framework. The Act is to be enforced by an agency known as the Fiscal Responsibility Commission within the primary duty of ensuring the advancement and implementation (Antai, 2024) of Nigeria's economic objectives and related matters, whether direct or indirect. The commission itself subject to sections 2 and section 3 has the function of monitoring the implementation of the Act (sec 3 (1) (c), conduct fiscal and financial analyses, as well as analyse and diagnose while disseminating the result or outcome to the general public (sec 3 (1) (c). The commission is also empowered to compel any government institution or person to disclose information relating to public revenue and expenditure and to cause an investigation into possible violations of the Act (sec 2 (1) (a) and (b).

The provisions of the FRA are so important because of the contents of part IX which makes provisions on Debt and Indebtedness specifically directing for the building of a debt management framework on certain rules. The Rules are in section 41 (1) (a) and (b) and are so important or fundamental. The first basic rule in section 41(1) (a) stipulates that the national government at all times shall only borrow for capital expenditure and human development (Antai & et al., 2024) provided that such borrowing shall be on concessional terms with low interest rate and with a reasonably long amortization period subject to the approval of the appropriate legislative body where necessary. While in section 41(1) b) Government shall ensure that the ratio of public debt to national income is kept at a sustainable level, as set from time to time by the National Assembly based on the Minister's advice. We see a huge challenge in defining what will

be considered a "sustainable level" because if we go by current cycle of external borrowing, I doubt it if any sane person would call what we have borrowed sustainable. The FRA largely aims at creating a culture of accountability by government at all levels and by financial institutions also.

By section 42 (3) the Fiscal Responsibility Commission is to ensure compliance with the threshold set by the law and this is to be done by verifying compliance. Apart from verifying compliance the Commission may also publish erring states that have surpassed the thresholds of consolidated debt. The provision that catches the reader's attention is section 42(5) which directs that at the end of any quarter, the consolidated debt of all the three tiers of government, should not exceed the respective limit. If that limit is exceeded then the tier of government Involved must by all means endeavor to scale back to the limit. As expected, any State that exceeds her borrowing limit is a violator and in violation. There are penalties for violation in section 42(6) of the FRA Act which must apply religiously. The implication is simply that a state or local government in violation of the threshold will not be allowed to go on borrowing. This is to ensure some form of sanity for the good of the entire federation.

Also, pursuant to section 43 (1) the servicing of external debts in Nigeria is the prerogative of the government that took on the debt, so if it is Local government for example or a State government, they will bear that responsibility (Kisubi, & et al., 2024) not the federal government. This is fair enough since State and Local government are free to also take loans to manage their states. Another important provision is the provision that allows for fiscal transparency (Anifowose, & et al., 2024) by all tiers of government and all institutions pursuant to section 48 of the Act. Section 49 mandates the government to publish audited accounts while section 47(1) allows the Minister of Finance can provide assurances on behalf of any government of the federation subject to federal executive council approval. The most accountable provision would probably be section 51 which allows even regular citizens to bring an action to ensure enforceability of the legislation. Consequently, a person shall have the *locus standi* to enforce the provisions of the Fiscal Responsibility Act and this can be done by obtaining prerogative orders or other remedies at the Federal High Court of Nigeria, without having to show any special or particular interest.

6. The Debt Management Office (Establishment, etc.) Act 2003

This legislation is an Act of the Nigerian National Assembly enacted as No. 18 of 2003 just after President Olusegun Obasanjo second tenure commenced. The legislation has the objective of establishing the Debt Management Office (DMO) and other incidental matters connected to the functions and duties of the DMO. The Act is not as elaborate as expected considering the subject of debt and its importance to the nation's growth. The interpretation Section is section 3 and Section 3 of the Act defines debt to include both domestic and external debts which is not a surprise. The Debt Management Office is created precisely under section 1 of the Act with the role or duty of advising the Nigerian Government on the financing gap for the succeeding financial year and the amount it is to borrow for bridging the gap both internally and externally. Since the DMO plays an advisory role also two things are expected from the hallowed office. First, the officials at the DMO must be highly qualified in every respect because their advice could very well make or mar the nation's future. Section 19 stands out emphatically and is worth mentioning here. That particular section 19 (2) of the Debt Management Act specifically states that the advice of the office to the government shall also serve as the basis of the national borrowing plan for the next financial year, pending approval by the National Assembly. Look how crucial a role they play.

The implication is straightforward, every loan for the government is negotiated and acquired with the full participation of the Debt Management Office, this is their very prerogative and the reason for their existence pursuant to section 19 (3). A combined reading of section 19 to section 21 shows that the Minister of Finance plays a very crucial role beyond just standing behind the scenes. In other words where any undertaking needs to be done or where any guarantee is to be made the Minister is responsible for doing that acting as the authorized agent of the president. He can also sign the necessary bonds or documents needed to be signed on behalf of the Federal Republic of Nigeria. So for example when Section 22 (1) of the DMO Act 2003 also says that the Federal Government is to guarantee external loans by section 22 (3), it is the Minister of Finance that has this duty, and where the law says that the government shall not guarantee an external loan unless the conditions of the loan shall have been laid before the National Assembly sanctioned by Resolution then it is the Minister that shall do this or through his disclosed representative. Apart from the Fiscal Responsibility Act which is unique and very important the DMO Act is probably one of those ranking legislations in this area. Just to reiterate some key points; it is the Minister of Finance that guarantees the loans on behalf of the

government but when it's due for repayment all such loans shall be considered a charge on the Consolidated Revenue Fund of the Federation or the Consolidated Revenue Fund of the State, as the case may be. Second point to be reiterated is the fact that regardless of the powers and functions of both the Debt Management Office (DMO) and Minister, it is the National Assembly that have approval power and sanctioning of external loans and issuance of guarantees.

7. The External Loans (Rehabilitation, Reconstruction and Development) (1970)

This legislation is one they call old but gold, it is a legislation that may have outlived its usefulness because it was enacted immediately after the three-year Nigerian civil war. The legislation has only two simple sections. This is a very short legislation with only two sections but it is worth mentioning because its role in the debt management space. The preamble to the legislation declares that the Act is intended to authorize the raising of loans abroad for the rehabilitation project. The first Section, Section 1 (1) (a) is important because the total external loans that could be raised at the time were not to exceed five billion naira which is five billion naira as of 1970. This Act is simplified making it very specific that the loans shall be for Rehabilitation and development programmes only and for no other. Unfortunately, this legislation has become moribund. Since an in-depth look of the most relevant law has been made it is now important to also consider what lie in the future for Nigeria. What lies in wait? Also looking at the debt debacle as a continent what can be learned to improve the status quo?

8. The Implications and Possible Lessons for Nigeria and other African Nations.

Public debt globally in 2022 stood at a little over \$92 trillion dollars with nations in the developing category owing slightly over 30% (United Nations, 2023). The implication then is that the debt crisis is not necessarily an African thing or only a Sub-Saharan African challenge or only a Nigerian challenge. Even developed nations struggle in this area having time after time austerity measures or debt restructuring to accommodate debt servicing and economic growth side by side. Since it is a global issue how can developing nations be shielded from the cycle? The first lesson would be for Sub Saharan African nations to band together economically and ease off movement and goods to ensure seamless productive transaction that would benefit the entire continent. Secondly, every developing nation must not shy away from any opportunity to have their debt written off by a creditor

or have their debt forgiven in totality. From time to time this happens especially in times of huge global crisis. This is why even chaos can be a ladder to climb up higher in the world. Following from the foregoing, Nigeria's debt relief from the Paris Club in 2005, leading to the cancellation of about 60% percent of the US\$30.85 billion owed by Nigeria at the time (Omotosho, Bawa & Doguwa, 2016). Debt forgiveness as rare as it is must always be maximized as it helps free up the economy for more foreign direct investment because it boosts investor's confidence and creates room for wide economic growth (Omotosho, Bawa & Doguwa, 2016).

The next lesson is in the medium of payment issue or the currency of payment issue. Put simply, the currency disparity is putting African nations at a great disadvantage. External debt payments may need to be made in a currency other than the unit of account used for reporting in the debt service payment schedule. So the lesson for Nigeria and other African nations is for such projected external debt payments and actual payments should be converted to the unit of account using the market exchange rate (International Monetary Fund, 2014). Or in the alternative, these nations should insist on dealing in their national currencies rather than the United States dollar or the euro. Because of the current system in the International Monetary Fund (IMF) in advising Compilers have advised that for borrowing in multicurrency's, payments should be estimated with consideration of the component currencies of the borrowing and the prevailing market exchange rates (International Monetary Fund, 2014). We still insist on the African nations insisting on their currency or perhaps pending when the proposed Eco (single currency for West Africa) comes into existence the situation may remain the same (Antai, 2024). Finally, the resource curse on the continent still rings true because if the continued poor maximization either due to corrupting potentialities or ignorance. It is not strange to say that economic development in developing countries can only be improved by closing the domestic resources gap. How can this be done without the neocolonial entities having their hands in our affairs? One way to overcome this is to emphasize more domestic industry than dealing outside the confines of their territory. It is therefore crucial for the Federal government to turn to domestic borrowing, ensuring that the funds are invested in productive channels that facilitate their eventual repayment and liquidation. If not for the aura of corruption that makes wealthy institution and individual hide their affluence that can help the government, we would not be running a road always to borrow.

9. Conclusion

Debt ordinarily should be avoided but in the lingua of nations and national growth in this context, debt acts as an injection into the economy and is highly encouraged. However, it is evident that excessive government borrowing can displace investment, leading to a significant reduction in output and consequently wages, which could leave citizens more vulnerable (Fayose, 2018). We would simply advice for a very strategic payment schedule to be drawn up for every external debt deal (Antai, 2024). A payment schedule offers a credible estimate of future payments as of a specified date, relying on a certain set of assumptions that are expected to evolve over time. However, a good schedule plan of payment should foresee likely changes whether on a national level or global level and design the plan accordingly. A debt service payment schedule projects payments based on the current gross external debt position as of the reference date. It aids in assessing liquidity risk by enabling both the data user and debtor to monitor whether there is a clustering of payments developing, irrespective of the initial maturity of the debt instrument (International Monetary Fund, 2014). The final proposition them is for more internal resources control a total divorce of all foreign interests so we can control the level of derivable income that can be generated. This may be the most difficult option yet because of alleged international syndicates allegedly in place to undermine the growth of Sub-Saharan African nations. It still remains a mystery why Nigeria cannot have a viable refinery; it is a mystery that seem to puzzle the mind but there's always more than meets the eye. In order not to sound like a conspiracy theorist we will end by suggesting a review of all external debt documents by a robust legal team of vibrant lawyers. All other African nations should do the same and the hands of the neocolonial entities should be forced out to allow more autonomy and clarity. If debt especially international threat is a trap, then we have to be smarter to see the trap ahead and dodge it collectively.

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Optimizing Primary Healthcare Infrastructure for Surgical Services in Dodoma: Strategies, Challenges, and Impact Assessment

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Abstract. Efficient primary healthcare infrastructure is crucial for ensuring universal access to surgical services. However, optimizing this infrastructure presents several challenges, including resource allocation, workforce training, and service delivery. This study aims to explore strategies, challenges, and impacts of integrating surgical services into primary healthcare in Dodoma. A cross-sectional approach was used to collect quantitative data from 105 health workers at Dodoma Referral Hospital through questionnaires. Data were analyzed using SPSS V26, with results presented in descriptive and inferential statistics. The study identified various strategies for optimizing healthcare infrastructure, such as effective resource allocation, timely availability of surgical equipment, workforce training, capacity-building programs, and the integration of technology. However, challenges such as insufficient equipment, staffing shortages, limited access to specialized care, financial constraints, and regulatory barriers hindered the optimization process. Multiple linear regression results indicated significant influences of independent variables on the dependent variables ($p \leq 0.05$). Correlation analysis revealed a strong positive relationship between strategy implementation and infrastructure optimization ($r = .876^{**}$, $p < .05$). It also showed a very strong positive relationship between addressing challenges and infrastructure optimization ($r = .868^{**}$, $p < .05$), and the impact of implemented strategies on service improvement ($r = .859^{**}$, $p < .05$). The study suggests that addressing these challenges, enhancing collaboration among healthcare professionals, integrating technology, and providing policy support are crucial for improving surgical services. Strengthening primary healthcare infrastructure and addressing staffing shortages are recommended to optimize healthcare delivery in Dodoma.

Keywords: Healthcare, Healthcare Infrastructure, Surgical Services, Primary Healthcare

1. Introduction

1.1 Background of the Study

Primary healthcare infrastructure is critical to meeting a variety of health demands in the global healthcare environment, from the provision of necessary surgical procedures to preventative care (Kyoung Kyun Oh et al., 2023). Every year, more than 234 million surgical operations are carried out worldwide to treat common ailments like burns, cancer, diabetes, cataracts, birth abnormalities, and obstructed labor. Given that several conditions that may be treated surgically are among the top 15 causes of physical impairment globally, surgery is predicted to grow more popular in the years to come. There are over 100 million injuries worldwide, with 90% of the burden falling on low- and middle-income nations. As a result, immediate and better surgical infrastructure is required to save lives and lower the number of deaths brought on by injuries (World Health Organization, 2015; Nuss et al., 2024).

Although primary healthcare has always placed a strong emphasis on preventative and basic medical services, there has been a growing interest in the integration of surgical treatment in these settings (Reddy et al., 2020). This change is a result of the realization that access to timely and suitable surgical therapies is crucial for improving health outcomes and that surgical conditions considerably contribute to the global burden of illness (Shabani et al., 2023). The World Health Organization's Universal Health Coverage (UHC) objective, which emphasizes the value of accessible, affordable, and high-quality healthcare for everyone, including surgical treatment,

is in line with the acceptance of surgical services in primary healthcare settings (Yanful et al., 2023).

Universal Health Coverage (UHC) is a global goal aimed at providing high-quality, needs-based healthcare services without financial hardship. Organization for Economic Cooperation and Development (OECD) explains that it consists of three components: essential services, financial protection, and coverage for the entire population (OECD, 2023). To achieve UHC, interventions should focus on supply and demand sides of the healthcare system, including infrastructural development and skilled personnel. Strategic infrastructure development can improve geographical access to health services, strengthen referral systems, increase service utilization, and improve health outcomes (Kapologwe et al., 2020a, Bhatia et al., 2022).

Global surgery has evolved over the past 40 years, with the majority of the world's population lacking access to skilled surgical care (Quene et al., 2022). In 2008, Paul Farmer and Jim Kim described global surgery as "the neglected stepchild of global health," which galvanized the global surgery community (Qin et al., 2023; Guest et al., 2017). In 2015, the World Bank published a volume on global surgery, and the Lancet Commission on Global Surgery published its findings (WHO, 2022). The World Health Organization (WHO) has linked surgery to social inequity, with the Lancet Commission on Global Surgery and World Health Assembly Resolution 68.15 contributing to this momentum (WHO, 2017; Bath et al., 2019). UNFPA reports in over 120 low-income countries to advocate for the inclusion of sexual and reproductive health services, as over 5 billion people worldwide lack access to safe, timely, and affordable surgical care which results in 4.2 million deaths annually ((UNFPA, 2023 & 2024) . Investing in quality surgical health care could prevent disability, mortality, and macroeconomic loss, especially for low- and middle-income countries. Untreated surgical conditions could result in a cumulative loss of \$20.7 trillion in the global economy, with more than half occurring in LMICs (Pigeolet et al., 2023).

Optimizing primary healthcare infrastructure for surgical services is not without its difficulties, though. The requirement for extensive capacity-building programs to provide basic healthcare institutions with the tools, training, and equipment required for surgical procedures is one of the main challenges (Ntuli Angyelile et al., 2020). One major obstacle that still needs to be addressed is the lack of skilled surgeons in primary care settings. Success in implementing these measures is also influenced by cultural beliefs and

community understanding on the role of primary healthcare in surgical services. The evaluation of these optimization initiatives' effects is complex and considers factors like better patient outcomes, less healthcare inequalities, and increased cost-effectiveness (Aveling et al., 2016; Bhati et al., 2023). By proactively tackling these obstacles, countries may develop strong primary healthcare systems that are able to provide crucial surgical services, advancing global health and accomplishing the objectives (Jumbam et al., 2023b).

Worldwide, most of developed countries have successfully optimized their primary healthcare infrastructure for surgical services through various strategies (African Development Bank Group, 2016; Akenroye et al., 2013). In Germany, the establishment of integrated care models and efficient referral systems has improved coordination between primary care and surgical services, enhancing patient access and reducing delays (Lippok, 2018; Hirsch et al., 2012; Schlette et al., 2009). Australia's success lies in its investment in telehealth technologies, facilitating remote consultations and preoperative assessments, thereby increasing accessibility to surgical care, especially in rural areas (Australian Government, 2022; Asiri et al., 2018; Mathew et al., 2023). Sweden's focus on standardized care pathways and multidisciplinary collaboration has streamlined the surgical process, ensuring consistent and high-quality care (Australian Government, 2022). Canada's success is attributed to a robust public healthcare system and targeted funding for surgical capacity expansion, addressing wait times and improving patient outcomes (Government of Canada, 2023). The success of these nations was faced by several challenges including resource allocation, workforce shortages, and technology implementation hurdles, which were mitigated through innovative solutions such as workforce training programs, public-private partnerships, and technology integration (Martin et al., 2018). The impact assessments indicated improved patient satisfaction, reduced wait times, and enhanced overall healthcare system efficiency in these countries (Sumalinog et al., 2015).

In developing countries health insurances campaigns have been implemented in different sectors, health care organizations have become front lines of addressing health equity, playing significant roles in not merely access and care delivery, but also as employers, community members, and advocates for change (Sara et al., 2021; Hsiao et al., 2007; Venkateswaran et al., 2022). This have been advantageous in providing equitable access to care, fulfilling our human potential in all aspects of health

and well-being, accomplishing an overall state of well-being encompassing clinical, mental, social, emotional, physical, and spiritual health (Duku, 2018).

Tanzania, being among the developing countries, is also facing health insurance challenges mostly to employed group of low wages. There is a tight public health care budget and growing need to improve access to health services, especially for the poor, majority of them working in the informal sector (Mnally, 2013; Swere, 2016). In dealing with these challenges socio-economic trends and political situation seems that health financing policy will become a major issue in Tanzania (Nuhu et al., 2020). Tanzania's rapid population growth is expected to reach 89.2 million people by 2035, necessitating significant infrastructure development, particularly in primary health facilities, to limit the increase in mortality rates, particularly neonatal and maternal mortality. Quality maternal health services have been a top priority for Tanzania's health sector, with a permanent agenda in all of its strategies, including the Health Sector Strategic Plans III and IV, the National Surgery, Obstetric and Anesthesia Plan (NSOAP), and Development Vision 2025 (NBS, 2018).

Tanzanian health policies have established a clear objective of achieving primary health care for all, by designing and implementing initiatives for increasing access to health care and ensuring that a majority of people live within 5 kilometers of health facilities. Reforms have been implemented in primary health care, such as the Health Sector Reform of 1994, the Medical Stores Department (MSD), Prime Vendor System (PVS), Health financing reforms, and Direct Health Facility Financing (DHFF) (Kapologwe et al., 2020).

From 2015 to 2019, there has been improvement in the physical status of primary health facilities, with 46% having a good state, 33% needing minor renovation, and 5.1% having landline telecommunication systems. Between 2015 and August 2019, a total of 419 health facilities (8.3%) were either renovated or constructed and equipped to offer safe surgery services (Endalamaw et al., 2023). Only 115 health centers (22.2%) offered Comprehensive Emergence Obstetric Care (CEMONC) services, 17.4% offered CEMONC services with all 9-signal functions (parenteral administration of antibiotics, treatments for eclampsia, parenteral administration of oxytocin, vacuum extraction, manual removal of placenta, removal of retained products of conception, newborn care, blood transfusion, and caesarian delivery of fetus in emergencies) and 17.4% had facilities offering safe blood transfusion services (Kapologwe et al., 2020a).

The lack of focused investigation into these facets is a major obstacle to the area's healthcare system, affecting the prompt and effective provision of surgical services. Consequently, a targeted study is necessary to guide policy and practice for the enhancement of Dodoma's primary healthcare system, guaranteeing the community's improved access to quality surgical services.

1.2 Statement of Problem

In many nations, achieving universal health coverage (UHC) is at the top of the agenda for health reform as defined by the World Health Organization (WHO) as the ideal functioning of an effective health system, whereby everyone has access to essential health services (such as palliation, promotion, treatment, prevention, and rehabilitation) of a caliber that is both effective and affordable (WHO, 2017).

In Tanzania, different interventions have been implemented to ensure health stabilization mostly in Surgery. During the December 2016 Joint Annual Health Sector Review conference, Presidential Office - Regional Administration and Local Government and Ministry of Health and Community Development, Gender and Elderly Care (MOHCDGEC). worked with many stakeholders, including Development Partners and reached a consensus on ways to enhance the physical state of deteriorating health facility buildings (MOHCDGEC, 2016). These include construction of new health facilities, renovation of old health facilities, Equipment availability, equipment processing, and Safe Surgery training to improve surgical performance. In December 2016, about 5072 primary health facilities were constructed, with 90% in rural and 10% in urban areas. 42.5% of people lived within 5-10km of these facilities. Between 2015 and 2019, 508 primary health facilities were constructed and renovated, including 350 health centers and 69 District Council Hospitals, and 390 staff houses (Kapologwe et al., 2020b).

Despite the importance of surgical interventions in addressing health issues, there is a lack of comprehensive understanding regarding the strategies essential for enhancing primary healthcare infrastructure for surgical services in Tanzania. Kapologwe et al. (2020b) reported that only 46% of primary health care facilities have a good state, with a majority (54%) of the health facilities left in poor state. Jumbam et al. (2023a) argues that low- and middle-income countries including Tanzania have developed national surgical, obstetric, and anesthesia plans (NSOAPs) but financing remains a challenge, fiscal space options from the beginning of policy

development are needed to take place. Azevedo (2017) also portrays that the absence of a structured and integrated framework for essential surgical services within Tanzania public primary healthcare facilities exacerbates several issues. This includes disparities in healthcare access, limited availability of surgical care, exacerbated financial burdens on individuals seeking surgical treatments, and fragmented healthcare delivery systems.

With this standing, this research aims to address this gap by investigating the specific strategies required for optimization, identifying challenges hindering the process. The absence of a targeted exploration of these aspects poses a significant barrier to the region's healthcare system, impacting the timely and efficient delivery of surgical services. Therefore, a focused investigation is essential to inform policy and practice for the improvement of primary healthcare infrastructure in Dodoma, ensuring better access and quality of surgical services for the local population.

1.3 Research Objective

This study focuses on Optimizing primary healthcare infrastructure for surgical services in Dodoma: It aims to identify the strategies, challenges, and impact of surgical service integration in primary healthcare at Dodoma region

2. Literature Review

2.1. Strategies Aimed at Optimizing Primary Healthcare Infrastructure

Stafinski et al., (2022) aimed to identify strategies used in Canada and internationally to improve wait times for patients, healthcare providers, and policymakers. Interviews with key informants from 14 countries and a scoping review were conducted to identify approaches targeting wait times. Results were compiled into tables and synthesized based on a conceptual framework. The study included 32 interviews, 92 peer-reviewed studies, and 242 documents from grey literature. 33 approaches were identified, with the majority targeting the supply-side. Fifteen approaches had consistent or limited but promising evidence supporting their effectiveness. Successful strategies require the implementation of multiple approaches and collaboration. Access to optimal care remains a top priority for patients, healthcare providers, and policymakers.

Okoroafor & Christmals, (2023) aimed to develop an implementation framework for task shifting and task sharing in Africa to improve access to people-centered health services. A sequential multimethod research design, scoping reviews, and qualitative descriptive

study were employed. The framework was evaluated for applicability in Africa by 36 subject matter experts. The framework has three core components: context, implementation strategies, and intended change. The implementation strategies include mapping and engaging stakeholders, generating evidence, developing, implementing, and reviewing a road map, and educating health workers using manuals, job aids, curriculum, and clinical guidelines. The framework serves as a guide for actions needed to achieve national, regional, and global goals based on contextual evidence. It illustrates the rationale and role of a combination of strategies in achieving universal health coverage (UHC).

The study of Kofi & Ussiph, (2017) aimed to optimize access to primary health care services in rural communities using Geographical Information System (GIS) in the Atwima Mponua District of Ghana. The research collected location data for 180 communities and existing health facilities using a GPS device. The data was analysed using the ArcGIS network analysis model and population data. The results showed that 61 out of 180 communities had no healthcare facility within an 8km radius, resulting in a large proportion of residents having to travel a long way to access healthcare. On average, patients travel between 6.62km and 21.20km to access healthcare. The study found that 26.39% of the district population lived beyond the 8km service area criteria. The study demonstrates that optimizing healthcare accessibility based on WHO standards can improve equity and spatial accessibility for the people of Atwima Mponua.

Kokko, (2022) examines the Triple Aim framework for health system assessment, focusing on the concept of balance among its goals. It evaluates the policy-level impact of value-based healthcare movements based on the Triple Aim goals. The analysis reveals a lack of consensus on the impact of each goal and the concept of a balance, and a lack of literature on the pursuit of the Triple Aim at the health system level. The study aims to contribute to improved health system performance assessment, development of the Triple Aim framework measures, and enhanced effectiveness in achieving healthcare goals.

Kapologwe et al., (2020b) analysed the public sector's efforts to improve the infrastructure of primary health facilities between 2005 and 2019 in Tanzania. Data was collected from various sources, including policy reports, the Services Availability and Readiness Assessment tool, the Health Facility Registry, implementation reports, and the Comprehensive Emergence Obstetric Care (CEMONC) signal functions assessment tool. The results showed that

46% of existing facilities had a good state, 33% needed minor renovation, and only 5% had water and telecommunication systems. Between 2015 and 2019, 8.3% of health facilities were renovated or equipped to offer safe surgery. However, there is still a high demand for good physical statuses and functioning primary health facilities to offer essential and safe surgical services.

2.2 Challenges Hindering the Optimization of Primary Healthcare Infrastructure

Grimes et al. (2019) highlight the lack of infrastructure in primary healthcare facilities for surgical services, including well-equipped operating rooms, recovery areas, and sterilization facilities. Insufficient availability of surgical equipment, anesthesia machines, and diagnostic tools can hinder the provision of surgical care. Facilities lacking basic amenities may struggle to maintain hygiene and safety standards during surgeries. Human resource challenges, such as the scarcity of trained surgeons, anesthetists, and perioperative nurses, also hinder the delivery of surgical services. Capacity-building initiatives are needed to attract and retain skilled healthcare professionals in remote or underserved areas, due to limited career development opportunities and inadequate living conditions.

The study by Shrimpe et al. (2015) highlights the challenges in optimizing primary healthcare infrastructure for surgical services. Limited financial resources can restrict investments in infrastructure development, staff training, and equipment procurement. Patients may face financial barriers, such as out-of-pocket expenses, which may prevent them from seeking surgical care. Cultural beliefs, misconceptions, and mistrust in healthcare providers can also deter community members from seeking surgical care. Traditional healing methods may compete with modern surgical interventions, and cultural norms and gender roles may affect access to surgical care, especially for women. Inconsistent or inadequate policies and regulations related to surgical services at the primary healthcare level pose challenges, necessitating advocacy for policy changes. Maintaining a consistent supply chain for surgical equipment, medications, and consumables is crucial in resource-constrained settings. Insufficient data collection and monitoring systems also hinder the assessment of surgical service quality and outcomes. Robust information systems are needed for effective monitoring.

The study of Swere, (2016) examines the challenges hindering Tanzania's health service accessibility,

including inadequate funding, a shortage of fully trained health staff, and poor communication and transport infrastructure. These issues hinder Tanzania's health system's development plans, including the Millennium Development Goal, due to its small budget. The review article provides a broader analysis of these challenges and recommends the Tanzanian government to take significant steps to resolve these issues.

2.3 The Impact of Implemented Strategies on Surgical Service Provision

Espinosa-González et al., (2019) studied the interactions between primary health care (PHC) functions and their impact on care delivery and outcomes. Using a system thinking approach and data from a three-round European Delphi process, the researchers developed a framework that analysed the correlations between PHC characteristics, how actors shaped these interactions, and their potential effect on care delivery. The findings showed that governance, financing, and regulation are influenced by their degree of decentralisation. The study suggests that this approach can help identify limitations due to poor accountability and commitment to shared objectives, and help design realistic and long-term policies for health system strengthening.

George et al. (2023) aimed to explore the impact of health system governance interventions on the quality of healthcare services in low-/middle-income countries (LMICs). A scoping review of 201 primary studies was conducted, focusing on leadership, system design, accountability and transparency, financing, private sector partnerships, information and monitoring, participation and engagement, and regulation. The findings revealed a stronger evidence base linking improved quality of care with health financing, private sector partnerships, and community participation and engagement strategies. The evidence related to leadership, system design, information and monitoring, participation and engagement, and regulation was also found to be robust. This research underscores the importance of improving healthcare quality in LMICs for achieving Universal Health Coverage and sustainable development goals.

The study by Alkire et al. (2018) found that early detection and management of surgical conditions can reduce morbidity and mortality rates. Integrating surgical services into primary healthcare offers a holistic approach to patient care, addressing both surgical and non-surgical health needs. This approach improves access to essential surgical services, especially in underserved and rural areas. It also

addresses health disparities by ensuring equitable access across different socio-economic groups. Vulnerable populations benefit from primary-level services, leading to increased utilization. Delivering surgical services at the primary healthcare level can be cost-effective, reducing the financial burden on individuals and the healthcare system. Early intervention and preventive measures can prevent the need for more expensive treatments.

Sheikh et al. (2011) argue that integrating surgical services into primary healthcare can make care more affordable, especially in low- and middle-income areas. This prevents catastrophic health expenditures and delays, promoting financial protection for individuals and households. Timely surgical interventions also lead to faster recovery times, promoting economic productivity. Integrating surgical services supports a holistic approach to healthcare delivery, positively impacting community health and well-being by addressing a range of health issues beyond surgical conditions.

Larkins et al. (2019) suggest that integrating surgical services can reduce health inequalities by providing equal access to essential care for individuals from different socio-economic backgrounds. Early surgical interventions at the primary healthcare level can prevent disease progression and reduce long-term treatment costs, contributing to overall cost savings in the healthcare system.

3. Research Methodology

This study utilized a cross-sectional and correlational design. The cross-sectional design was chosen to efficiently capture a snapshot of surgical service integration in primary healthcare at Dodoma, allowing simultaneous data collection from various respondents. The correlational design helped assess the relationship between dependent and independent variables using multiple linear regression and bivariate correlation analysis. The quantitative approach involved questionnaires to gather primary data, which was analyzed through descriptive statistics and

4. Results

Table 4.1: Respondent Rate

Respondents	Frequency	Percentage
Responded	105	94.59
Not responded	6	5.41
Total	111	100

Source: Field Data, (2024)

regression techniques. Normality and collinearity tests were also conducted.

The study took place at Dodoma Regional Referral Hospital, a key healthcare facility in Central Tanzania, established in 1930 with 420 beds and 35 outpatient rooms. Serving as a referral center for several districts, the hospital plays a crucial role in surgical care. The study aimed to explore strategies to enhance primary healthcare infrastructure for surgical services in Dodoma, focusing on challenges and impacts.

The population consisted of health workers involved in surgeries, aged 20 to 51, across departments like ENT, General Surgery, Obstetrics, Ophthalmology, Orthopedic, and Oral and Dental services. Inclusion criteria focused on healthcare workers directly involved in surgeries, while non-surgical staff, those outside the specified departments, and workers outside the age range were excluded.

Sample size determination followed the formula by Younas (2019), resulting in a sample size of 111 participants, accounting for a 10% non-response rate. Multi-stage sampling was used, starting with purposive selection of Dodoma as the study area due to its strategic healthcare importance. The hospital was selected as the primary site, and surgical departments relevant to the study were identified.

Primary data was collected using structured questionnaires, which included consent forms, demographic questions, and sections on strategies to optimize surgical services, challenges, and impacts. The questionnaire was available in both English and Kiswahili to ensure clarity for participants.

Data was analyzed using SPSS version 26 and Microsoft Excel for cleaning, sorting, and coding. Descriptive statistics, Chi-square tests, and linear regression were used to identify associations between variables. The reliability of the instruments was tested using Cronbach's Alpha, with satisfactory results (values above 0.7). Validity was ensured through pilot testing, and the instruments were adjusted based on feedback.

Table 4.1 shows that only 105 out of 111 respondents responded and provided accurate answers to this study. Therefore, the study analysis based on response rate of 94.59% which is fair and representative according to (Mugenda, 2003) stated that, a response rate of >50% is required for analysis and representation of data.

Table 4.2: Demographic Information of respondents

Demographic Information (N=105)	Frequency	Percentage (%)
Gender		
Male	56	53.33
Female	49	46.67
Age of Respondent (Years)		
20-30	8	7.62
31-40	22	20.95
41-50	40	38.10
51 Years and Above	35	33.33
Respondent Education Level		
Certificate	22	20.95
Diploma	30	28.57
Bachelor	43	40.95
Masters and above	10	9.53
Respondent's Role		
Surgeon	10	9.52
Anesthetist	8	7.62
Surgical Nurse	15	14.29
Surgical Technologist	7	6.67
Operating Room (OR) Coordinator	11	10.48
Surgical Assistant	20	19.05
Recovery Room Nurse (PACU Nurse)	12	11.43
Infection Control Practitioner	9	8.57
Perioperative Nurse	13	12.38
Years of Experience in surgical services		
0 - 2 Years	9	8.57
3 - 4 years	21	20.00
5 - 6 Years	42	40.00
7 Years and above	33	31.43

Source: Field Data, (2024)

The table 4.2 shows a balanced gender distribution, with 53.33% male and 46.67% female respondents, the majority being experienced professionals aged 41-50 (38.10%), highly educated with most holding bachelor's degrees (40.95%), and holding diverse roles like surgical assistants (19.05%) and nurses (14.29%), with significant experience, particularly 5-6 years (40%) and 7+ years (31.43%), showcasing their expertise and deep insights into healthcare infrastructure and surgical service integration.

5. Descriptive Analysis Findings

Research findings Presented based on questionnaires completed by respondents, who rated various statements using a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The researcher used an itemized rating scale to assess respondents' perceptions of each variable, with the mean score falling within specific intervals: 1.00–1.80 (Strongly Disagree), 1.81–2.60 (Disagree), 2.61–3.40 (Neutral), 3.41–4.20 (Agree), and 4.21–5.00 (Strongly Agree). The rating scale and intervals were based on Saunders (2016) to analyze the data.

4.3.1: SPECIFIC STRATEGIES AIMED

	N= 105	Mean	Std. Deviation	Interpretation
SSA1	Allocation of resources of facilities is well-aligned with the needs of surgical services	3.92	0.937	Agree
SSA2	Availability and accessibility of surgical equipment in our facility are timely and efficient	3.73	1.187	Agree
SSA3	Regular training and capacity-building programs are conducted to enhance the skills of surgical health workers	3.50	1.226	Agree
SSA4	Effective collaboration between surgical health workers and other healthcare professionals to optimize patient care	3.83	.985	Agree
SSA5	Integration of technology in our primary healthcare infrastructure enhances the efficiency of surgical services	3.80	1.087	Agree

SSA6	Patient education programs are implemented to promote awareness and understanding of surgical procedures and aftercare	3.59	1.335	Agree
SSA7	Structured feedback mechanism in place to gather input from surgical health workers regarding the effectiveness of healthcare infrastructure for surgical services	3.63	1.339	Agree
SSA8	Policy and Regulatory Support	4.02	1.126	Agree

Respondents generally agreed (mean values ranging from 3.50 to 4.02) that optimized primary healthcare infrastructure for surgical services is supported by well-aligned resource allocation, efficient equipment availability, regular training, technology integration, patient education, effective collaboration, and strong policy and regulatory frameworks.

4.3.2. CHALLENGES

N= 105		Mean	Std. Deviation	Interpretation
CHO1	Lack of Adequate Surgical Equipment and Facilities	3.71	1.072	Agree
CHO2	Insufficient Training and Capacity Building Programs	3.58	1.299	Agree
CHO3	Inadequate Staffing Levels for Surgical Services	3.57	1.208	Agree
CHO4	Limited Access to Surgical Specialties and Subspecialties:	3.60	1.334	Agree
CHO5	Challenges in Information Technology and Data Management	3.55	1.315	Agree
CHO6	Financial Constraints Impacting Surgical Services	3.55	1.126	Agree
CHO7	Regulatory and Administrative Barriers	3.52	1.324	Agree

The study identifies key challenges in optimizing primary healthcare infrastructure for surgery in Dodoma, including a lack of adequate equipment (mean value 3.71), insufficient training (mean value 3.58), and inadequate staffing (mean value 3.57). Respondents also highlight limited access to surgical specialties (mean value 3.60), IT and data management issues (mean value 3.55), financial constraints (mean value 3.55), and regulatory barriers (mean value 3.52) as significant obstacles. These factors collectively hinder the effective delivery of surgical care in the region

4.3.3 IMPACT OF IMPLEMENTED STRATEGIES

N= 153		Mean	Std. Deviation	Interpretation
IIS1	Resource Availability	3.86	1.087	Agree
IIS2	Patient Satisfaction	3.97	0.871	Agree
IIS3	Quality of Surgical Care	3.97	0.945	Agree
IIS4	Training and Professional Development	3.84	1.102	Agree
IIS5	Community Outreach and Awareness	3.91	0.942	Agree
IIS6	reduced waiting times	3.59	1.089	Agree
IIS7	more sustainable surgical healthcare system	3.72	1.114	Agree
IIS8	improved the dissemination of surgical guidelines and protocols	4.01	0.814	Agree

The majority of respondents (mean values ranging from 3.59 to 4.01) agreed that the implemented strategies significantly improved various aspects of surgical service provision in Dodoma’s primary healthcare infrastructure, including resource availability (3.86), patient satisfaction (3.97), care quality (3.97), workforce training (3.84), community awareness (3.91), waiting times (3.59), system sustainability (3.72), and the dissemination of surgical guidelines (4.01).

4.4. Model Summary

4.4.1. MULTIPLE LINEAR REGRESSION MODEL

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.893 ^a	.798	.792	.428	.374

Predictors: (Constant), Strategies, Challenges, Impacts
 dependent: Optimizing primary healthcare infrastructure.

The regression model reveals that 79.2% of the variation in optimizing primary healthcare infrastructure for surgical services in Dodoma is explained by the predictor variables—strategies, challenges, and impacts—while the remaining

20.8% is influenced by other factors; with a strong positive correlation ($R = 0.893$) between these determinants and the optimization process

4.4.2. ANALYSIS OF VARIANCE (ANOVA)

I	Model	Sum of Squares	Df	Mean Square	F	Sig.
	Regression	72.913	3	24.304	132.853	.000 ^b
	Residual	18.477	101	.183		
	Total	91.390	104			

Predictors: (Constant), Strategies, Challenges, Impacts

Dependent: Optimizing primary healthcare infrastructure

Results (Sig = 0.000, $p < 0.05$) confirm that the model is statistically significant at a 95% confidence level, indicating a meaningful relationship between the dependent and independent variables.

4.4.3. CORRELATION ANALYSIS TEST

	Mean	Std Deviation	1	2	3	4
1Strategies			1			
2Challenges			.820**	1		
3Impacts			.774**	.968**	1	
4Optimizing primary healthcare infrastructure			.876**	.868**	.859**	1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Field Data (2024)

4.4.4. MULTIPLE REGRESSION ANALYSIS COEFFICIENTS

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
	B	Std. Error	Beta			
(Constant)	.475	.216		2.202	.029	
1	SSA	.652	.098	.627	6.666	.000
	CHO	-.219	.087	-.210	2.526	.013
	IIS	.007	.114	.007	.063	.001

a. Dependent Variable: Optimizing primary healthcare infrastructure

Keyword: SSA = Strategies, CHO = Challenges, IIS= Impacts

Regression is significant at the 0.05 level (2-tailed)

Specifically, implementing strategies (SSA) has a strong positive effect on infrastructure optimization ($\beta = 0.652$, $p < 0.001$), while challenges in services (CHO) negatively impact optimization ($\beta = -0.219$, $p = 0.013$). Additionally, analyzing the positive impacts of implemented strategies (IIS) also contributes positively ($\beta = 0.007$, $p < 0.001$), highlighting the importance of strategic implementation and challenge mitigation in enhancing surgical service infrastructure.

6. Discussion

This study aimed to identify strategies for optimizing primary healthcare infrastructure in Dodoma to enhance surgical services delivery. The study respondents' average mean values ranging from 3.59 to 4.02 reveals respondents' agreements on availability of several strategies, including resource allocation, timely availability and accessibility of surgical equipment, regular training and capacity-building programs, effective collaboration between healthcare professionals, integration of technology, patient

education programs, structured feedback mechanisms, and policy and regulatory support.

However, challenges hindered the optimization of primary healthcare infrastructure for surgical services in Dodoma with respondents' agreements with average mean values from 3.71 to 3.52. The lack of adequate surgical equipment and facilities, insufficient training and capacity-building programs, inadequate staffing levels, limited access to surgical specialties and subspecialties, challenges in information technology and data management, financial constraints, and regulatory and administrative barriers were identified as significant challenges.

The impact of implemented strategies on surgical service provision within Dodoma's primary healthcare infrastructure was also evaluated. Results of respondents mean values 3.59 to 4.01 depict that implemented strategies positively impacted resource availability, patient satisfaction, quality of care, training and professional development opportunities, community interaction and awareness efforts, reduced

waiting times for surgical services, and built a more sustainable surgical healthcare system. Additionally, they improved the dissemination of surgical guidelines and protocols, suggesting better standardization and adherence to best practices in surgical care delivery.

The study used inferential statistical analysis to identify the strategies, challenges, and impact of surgical service integration in primary healthcare at Dodoma Referral Hospital. A Multiple linear regression model was applied to assess the influence of dependent variables (Optimizing primary healthcare infrastructure) and independent variables (Strategies, Challenges, Impacts). The regression model showed that 79.2% of the variance in optimizing primary healthcare infrastructure for surgical services in Dodoma was explained by the variation of the three predictor variables, while the remaining 20.8% was explained by other variables not explained in the model. ANOVA was used to test the hypothesis that multiple R in the population equals 0. The results showed a strong positive relationship between implementing specific strategies and optimizing primary healthcare infrastructure for surgical services, solving persisting challenges, and the impact of implemented strategies on surgical services.

Multiple linear regression analyses were conducted to evaluate the influence of each predictor variable separately. The study found that implementing specific strategies (SSA) positively influenced optimizing primary healthcare infrastructure on surgical services, while the minimizing present of challenges in services (CHO) had a positive influence. Analyzing positive impacts from implemented strategies (IIS) also had a significant effect on optimizing primary healthcare infrastructure for surgical services with beta values of 0.652, 0.219 and 0.007 respectively.

7. Recommendations

The study highlights the importance of strategic professional development and collaboration within Dodoma Referral Hospital's healthcare ecosystem. Continuous training, interdisciplinary teamwork, and technology integration can significantly improve surgical services. Strengthening primary healthcare infrastructure, particularly in surgical services, requires dedicated resources for equipment, training, and addressing staffing shortages. Policymakers must streamline regulatory processes and secure sustainable funding to ensure long-term surgical care improvements.

Collaborative policymaking, involving key stakeholders, is crucial to enhancing the healthcare system's resilience. The study also recommends expanding research to include other primary healthcare infrastructures across Tanzania, beyond just Dodoma.

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Effect of Government Entrepreneurial Policies on Indigenous Women Entrepreneurs in North-Central, Nigeria

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Abstract. This study assesses the effects of government entrepreneurial policies on indigenous women entrepreneurs in North-Central Nigeria, focusing on how entrepreneurial activities such as producing Peanut-Cake (Kuli-Kuli) and Handwoven Cloth (Aso Ofi) etc contribute to poverty alleviation among rural women. It assesses how the National Social Investment Program (NSIP) and the Government Enterprise and Empowerment Program (GEEP) affect the economy of rural women empowerment and identifies the difficulties these women encounter. The research work adopts a descriptive survey approach, the research makes use of both primary and secondary data sources: primary data were collected through a questionnaire while secondary data was sourced from official documents of registered Indigenous women entrepreneurs and other sources. Empowerment theory was adopted to analyse the impact of these policies. Findings illustrate that, despite the programs' goals to enhance their financial resources and access to the market, their effectiveness has been limited. Key issues include insufficient access to capital, value-restrictive cultural norms, and inadequate program support. The study recommends that entrepreneurial policies should be designed to meet the needs of Indigenous women entrepreneurs, improve access to financial resources, expand training opportunities, and address cultural barriers in the studied area

Keywords: Entrepreneurial, Women, Policies, Indigenous

1. Introduction

Global recognition has shown that entrepreneurship is the cornerstone of any economy. Many people, both intelligent and illiterate, believe it to be the hub around which economies around the globe expand and flourish. Numerous nations across the globe have effectively implemented entrepreneurship in their economic expansion and advancement, noting that it has resulted in the longevity, prosperity, and viability of their economies. The CRIBA countries China, Russia, Indonesia, Belgium, and Argentina offer abundant empirical evidence of the critical roles that entrepreneurship plays in the expansion and advancement of economies globally (Agbionu et al., 2015).

In the last two decades, there has been a significant increase in scholarly literature about female entrepreneurship worldwide. Women's entrepreneurship is seen to get a significant amount of attention as a topic of scholarly debate itself, according to Carter and Cannon (1992), the primary reason for these interests is that female entrepreneurs are now viewed as significant contributors to their countries' economic development, which is essential for reducing poverty. Women who engage in small- or large-scale, full- or part-time, or even international, entrepreneurial operations are referred to as women entrepreneurs. Agbionu et al (2015) provided evidence to support the aforementioned claims, stating that women entrepreneurs are just women who engage in all aspects of entrepreneurship and take the risks associated with combining resources in novel ways to produce goods and services that allow them to capitalize on opportunities found in their immediate

environments. This undoubtedly depends on the reality that women have been and continue to be agents of poverty alleviation, as the principles of poverty alleviation are essential to any real growth and development.

Rural communities are disproportionately affected by poverty because they have less access to resources, economic opportunities, and education (World Bank, 2018). Poverty is still a major global issue (World Bank, 2020). Reducing poverty has been a priority for governmental and non-governmental organisations in developing areas like North Central Nigeria. Given the crucial role women play in the socioeconomic fabric of their communities, developing entrepreneurial skills among rural women has emerged as one of the many tactics being used to empower rural women.

North-Central Nigeria which includes the states of Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau has distinct socioeconomic difficulties. In comparison to the national average, these states have greater rates of poverty, according to the National Bureau of Statistics (2020). Reliance on subsistence farming, slow industrial development, and poor infrastructure are some of the factors causing this (NBS, 2020). High rates of poverty are particularly prevalent in rural areas, where access to financial, medical, and educational resources is restricted (Olusegun, 2018).

In rural North Central Nigeria, women in general play a crucial role in the local economy by working in small-scale businesses, trade, and agriculture. Notwithstanding their noteworthy accomplishments, they encounter considerable obstacles, such as restricted availability of credit, education, and training (Afolabi, 2015). Developing these women's entrepreneurial talents not only improves their financial situation but also promotes the growth of the community as a whole. Research indicates that women reinvest up to 90% of their income back into their communities and families, but males only do so for 30–40% of their income, highlighting the potential significance of focused interventions (Adewale, 2019).

To address these issues, a number of initiatives aimed at reducing poverty have been introduced recently. These initiatives usually try to give rural women more tools, training, and financial support to help them become more successful entrepreneurs. Notable programs include the National Social Investment Program (NSIP) and the Government Enterprise and Empowerment Program (GEEP), which provide business development services and microloans to female entrepreneurs (Oluwatobi, 2021). Particularly, North Central Women especially in Niger and Kwara

States are well known for Peanut-Snack (Kuli-Kuli) production and those of Kwara, Kogi, Benue and Plateau are well known for Handwoven Fabric/Cloth (Aso Ofi). Moreover, the cultural significance and economic potential of indigenous crafts such as peanut snacks (Kuli-Kuli); Cheese (Wara Nkasi); Handwoven Fabric/Cloth (Aso Ofi); Henna (Lali); Indigo-dyed Cloth (Adire); and Black Soap (Ose-Dudu) underscore the diversity and resilience of local entrepreneurship in North-Central Nigeria. These traditional products not only represent artistic heritage but also serve as sources of livelihood and community cohesion, reflecting the entrepreneurial spirit ingrained within local cultures.

1.1 Statement of the Problem

In North-Central Nigeria, persistent poverty is a major obstacle to both economic progress and sustainable development, especially in rural regions. Because of the area's reliance on subsistence farming, slow industrial development, and poor infrastructure, high rates of poverty persist despite several attempts by both the government and non-governmental organizations (NBS, 2020). The majority of rural residents work in low-paying jobs and lack access to basic services and resources including banking, healthcare, and education (Olusegun, 2018).

These economic difficulties disproportionately affect women, who make up a sizable share of the rural labour force. They frequently operate in small-scale businesses, trade, agriculture, and handicrafts, but they encounter several obstacles, including difficulty getting credit, education, and entrepreneurial training (Afolabi, 2015). These obstacles are made worse by cultural norms that limit women's ability to participate in the economy and make decisions, such as household responsibilities, inheritance laws and property rights, limited mobility, etc. (Ayoade, 2016). Indigenous entrepreneurial activities, such as producing Peanut-Cake (Kuli-Kuli), Cheese (Wara nkasi), Handwoven Cloth (Aso Ofi), Henna (Lali), Indigo-dyed Cloth (Adire), and Black Soap (Ose dudu), offer potential pathways out of poverty. However, Indigenous Women Entrepreneurs seem not to have benefited significantly from government policies. Many obstacles, such as poor infrastructure, cultural resistance, and the absence of an ecosystem that supports entrepreneurs, impede the effectiveness of programs aimed at reducing poverty, such as the Government Enterprise and Empowerment Program (GEEP) and the National Social Investment Program (NSIP) (Chukwu, 2017). Due to these interconnected constraints, these programs, albeit providing microloans and business development services, do not

appear to have completely closed the gap between prospective benefits and actual outcomes (Oluwatobi, 2021).

Ayoade (2016) notes that a deficiency of focused entrepreneurial training programs that cater to the unique requirements and environments of rural women impedes their capacity to proficiently oversee and grow their businesses. The total impact of entrepreneurial ventures is diminished by women's limited engagement in economic activities and decision-making processes, which stems from deeply ingrained gender stereotypes and societal expectations (Adewale, 2019). Inadequate electricity, communication, and transportation infrastructure also make it difficult for rural entrepreneurs to access markets, run their businesses, and receive support services (Chukwu, 2017). The networks and mentorship opportunities that are essential for the expansion and longevity of businesses are frequently inaccessible to women entrepreneurs (Ekpe, 2011).

Based on these premises, an attempt was made to provide answers to the following research questions:

- How do indigenous entrepreneurial activities, such as producing peanut cake (Kuli-Kuli) and Handwoven Cloth (Aso Ofi) etc, contribute to poverty alleviation among rural women in North-Central Nigeria?
- What are the specific constraints faced by rural women entrepreneurs in North-Central Nigeria?
- What are the successes and limitations of poverty alleviation programs like GEEP and NSIP in empowering rural women entrepreneurs in North-Central Nigeria?

1.2 Research Objectives

- To explore how indigenous entrepreneurial activities, such as producing peanut cake (Kuli-Kuli) and Handwoven Cloth (Aso Ofi), contribute to poverty alleviation among rural women in North-Central Nigeria.
- To identify the specific constraints faced by rural women entrepreneurs in North-Central Nigeria.
- To evaluate the successes and limitations of poverty alleviation programs like GEEP (Government Enterprise and Empowerment Program) and NSIP (National Social Investment Program) in empowering rural women entrepreneurs in North-Central Nigeria.

2. Literature Review

2.1 Conceptual Clarifications

2.1.1 Poverty Alleviation Programmes

A wide range of initiatives are included in poverty alleviation programs, which are designed to lessen the incidence and effects of poverty in communities. These programs are primarily directed toward vulnerable groups, such as women living in rural areas who are faced with significant economic challenges as a result of limited access to resources, opportunities, and education. The overall objective of poverty alleviation programs is to enhance the socioeconomic well-being of individuals and communities by addressing the underlying causes of poverty and offering assistance in areas like healthcare, employment, education, and entrepreneurship.

In the realm of poverty alleviation, Carter and Cannon (1992) underscore the importance of adopting a comprehensive approach that addresses the intricate nature of poverty. They underline the necessity of interventions that cover job, healthcare, education, and entrepreneurship opportunities in addition to financial aid alone. According to Carter and Cannon (1992), this holistic approach acknowledges that poverty is an issue influenced by social, cultural, and environmental elements in addition to economic ones.

Afolabi (2015) stresses the importance of adopting holistic methods in initiatives aimed at reducing poverty, especially when considering the economic empowerment of women residing in rural areas. Afolabi (2015) asserts that rural women encounter particular difficulties that make it difficult to climb out of poverty, such as restricted access to credit, education, and entrepreneurial training. Poverty alleviation programs can foster an atmosphere that allows rural women to prosper economically by using community involvement activities, empowerment tactics, and capacity building. Afolabi (2015) has provided valuable insights that emphasize the need to tackle systemic impediments and implement customized interventions that cater to the unique requirements of underprivileged communities.

2.1.2 Rural Women

Rural women are women who live in rural areas, which are characterized by lower population densities, economies based mostly on agriculture, and restricted access to modern infrastructure and basic services (Olusegun, 2018). Inadequate access to healthcare,

education, and financial services can have a negative influence on rural women's everyday lives and economic prospects. According to the UN (2018) rural women are people who live in rural areas and are frequently involved in household labour, agriculture, and small-scale businesses. Despite facing numerous obstacles like restricted access to resources, healthcare, and education, these women play a critical role in food production and rural economies.

According to the World Bank (2019), rural women are people who live in rural areas and are essential to the home economics and agricultural sectors. When it comes to decision-making processes, markets, education, and productive resources, they frequently lack access to urban women and their male counterparts. According to FAO (2011) rural women make significant contributions to home economics and agricultural labour in rural areas. They play a critical role in maintaining food security and protecting the environment, but they frequently face obstacles like gender discrimination, financial access issues, and a lack of educational opportunities. According to IFAD (2010) rural women are people who work in both agricultural and non-agricultural fields and reside in rural areas. They are crucial to sustaining household livelihoods and boosting the rural economy, yet socioeconomic policies and practices frequently marginalize them by preventing them from accessing necessary resources and services.

2.1.3 Entrepreneurial

People or organizations that are prepared to take chances and launch businesses with the intention of adding value and turning a profit are involved in entrepreneurial activities. This can involve creating brand-new companies, creating cutting-edge goods or services, or rethinking current markets or procedures to create value for the economy and society. When navigating the chances and challenges that come with being an entrepreneur, creative thinkers, resilient people, and those who are willing to embrace uncertainty are traits that entrepreneurs frequently display (Kirzner, 1979; Sarasvathy, 2001). According to Robert (2009), entrepreneurship is the process of producing something new and valuable by investing the required time and energy, taking on the associated financial, psychological, and social risks, and reaping the rewards of independence and financial gain.

According to Hamzat (2021), entrepreneurship is the proactive identification and utilization of opportunities, with a focus on expanding beyond resources under control. In furthering this concept, Hisrich (2009) describes entrepreneurship as the

process of producing something new and valuable, requiring dedication, taking calculated risks, and pursuing rewards in the form of material and emotional fulfilment. Anita (1991) highlights the transformative impact of entrepreneurial vision by describing entrepreneurship as the ability to develop and build something from essentially nothing, adding a degree of creativity and resourcefulness. In line with this idea, Richard (2012) highlights that entrepreneurship is characterized by the search for opportunities that extend beyond one's current resources. Peter (1985) highlights the process-oriented aspect of entrepreneurship, characterizing it as the exploration of novel approaches to amalgamating resources in order to generate value.

Oluwakemi Adesina (2019) asserts that traditional textile production like the handwoven Aso-Ofi cloth is essential to the rural people of Nigeria's ability to make ends meet. In addition to protecting cultural legacy, Adesina contends that this technique provides a reliable source of income, especially for women who are frequently disenfranchised from other economic sectors. The report also highlights how the utilisation of indigenous knowledge and resources is made possible by the localized nature of Aso-Ofi manufacturing, which helps to create a sustainable employment model that is resistant to outside economic shocks. Furthermore, research by Okeke and Musa (2018) discovered that because traditional crafts like Aso-Ofi rely heavily on locally obtained materials and there is a strong market for textiles with cultural significance, the jobs they create are sustainable. The intergenerational transfer of skills, which guarantees that the trade continues to offer employment possibilities across various age groups within rural communities, further supports its sustainability.

2.1.4 Skills Development

According to academic conceptions, skills development is the comprehensive process of learning and honing the competencies required for both efficient performance and personal development. The adaptability of learning experiences is emphasized by Billett (2009) who also highlights the ways in which social, personal, and environmental elements interact to shape the development of skills. Billett contends that learning happens not just via formal education but also from regular contacts and activities, with people constantly honing their abilities in response to shifting circumstances.

Kolb (2014) asserts that direct experience is the main source of learning and growth and emphasizes

experiential learning as a crucial component of skill development. People integrate new knowledge and abilities into their previous understanding through active exploration, reflection, and abstraction, which promotes deeper learning and improved competencies. According to Tynjälä (2013), learner-centred approaches that place an emphasis on active participation, critical thinking, and lifelong learning are the way to go if educational changes are to support the development of skills. Through creating an atmosphere that encourages investigation, learning, and introspection, educators can enable people to acquire the competencies and proficiencies required to prosper in the ever-changing and intricate world of today.

2.2 Theoretical Framework

The theoretical framework is defined as a theoretical mirror or pillar upon which research works are seen or built. The importance of it cannot be over-emphasised.

2.2.1 Empowerment Theory

Empowerment Theory, developed by Julian Rappaport in the 1980s, focuses on enabling individuals, communities, and organizations to gain control over their lives and influence their social and political environments. In order to be truly empowered, the theory highlights the importance of critical knowledge, involvement, and resource availability. Individuals and organizations can get a sense of control and influence over their situations by actively participating in community activities and decision-making processes. In order to identify and confront oppressive systems and structures, it is essential to have a thorough awareness of the social, political, and economic forces that influence an individual's existence.

Access to a range of resources, such as knowledge, training, funding, and social networks, is also necessary for empowerment in order to enable people and communities to take initiative and realize their objectives. Empowerment Theory, which is frequently used in the domains of psychology, social work, public health, and community development, aims to advance social justice, equality, and the welfare of people and communities by encouraging a sense of agency and self-efficacy. All things considered, it offers a framework for comprehending and assisting individuals in gaining authority, control, and the capacity to bring about constructive change in their lives and communities.

2.2.2 Relevance of Empowerment Theory to the Study

The theory of empowerment provides a strong foundation for understanding and resolving the myriad of issues that rural women in North-Central Nigeria face with regard to reducing poverty and cultivating entrepreneurial abilities. First of all, it emphasises how important it is to give people more agency by creating opportunities for skill development and financial independence. This is especially important for rural women who are suffering from socioeconomic limitations. Second, empowerment theory stresses capacity building through education, training, and skill development all of which are crucial for improving livelihoods which is in line with the goals of programs aimed at reducing poverty. Thirdly, it emphasizes the necessity of focusing on women's economic empowerment through entrepreneurial endeavours in order to overcome gender inequities, a significant issue in Nigerian society. Furthermore, empowerment theory highlights the significance of involving rural communities in the development process, promoting sustainability and group advancement, by stressing community involvement and participation. Furthermore, in keeping with the empowerment theory's emphasis on self-belief and agency, developing entrepreneurial skills can support women's self-efficacy and confidence, which are critical components in battling poverty and bringing about long-lasting change. Finally, having a solid understanding of empowerment theory can help policymakers create more sustainable development and long-term empowerment policies that promote the holistic growth of rural women and their communities while also reducing poverty.

3. Methodology

The study employed a descriptive survey methodology, sourcing data from both primary and secondary sources. The population size of this research work covered three states in the North-Central which amongst Kogi, Kwara and Niger states, Nigeria. Which approximated at 17,335 (Survey-field, 2024). The Taro Yamane formula was used to determine the sample size for this study. According to Israel (1992), the Yamane formula is expressed as follows:

$$n = \frac{N}{K + N(e)^2}$$

Where: n = Sample size

N = Total population (Kogi, Kwara and Niger States)

k = 1

e = 0.05%

n = 17,335

$$n = \frac{17,335}{\sqrt{1 + 17,335 (0.05)^2}}$$

$$n = \frac{17,335}{\sqrt{1 + 17,335 (0.0025)}}$$

$$n = \frac{17,335}{1 + 43.3375}$$

$$n = \frac{17,335}{44.3375}$$

$$n = 391$$

Therefore, the sample size for the study is 391. A total of 391 copies of the questionnaire were distributed to all target populations. To make sure that each population is proportionally represented in the sample, the researchers did a proportional calculation. The first step in this process is to divide the population of each state by the 17,335 total population, then multiply the resulting number by the 391-sample size. This process is demonstrated in the following table.

Table 1: Number of Allotted Questionnaires to the Target Population

S/N	Target Respondents	Population	Calculations	Allotted Questionnaire
1	National Association of Kuli-Kuli Processors and Marketers	3,700	$3700 \div 17,335 \times 391 = 84$	84
2	National Association of Small and Medium Enterprises (NASME)	8,911	$8,911 \div 17,335 \times 391 = 201$	201
3	Nigerian Association of Women Entrepreneurs (NAWE) (<i>Aso Ofi</i> , “handwoven cloth” & <i>Ose-dudu</i> “Black Soap”)	2,398	$2398 \div 17,335 \times 391 = 54$	54
4	Association of Henna Artisans and Suppliers (AHAS)	874	$874 \div 17,335 \times 391 = 19$	19
5	Association of Adire Artisans and Marketers	1,452	$1452 \div 17,335 \times 391 = 33$	33
	Total	17,335		391

Source: Official Registered of Association, 2024

The above illustrates how the questionnaire was effectively distributed to all target populations. This distribution strategy facilitated the collection of data for the study and guaranteed a high response rate.

Table 2: Respondents Rate

S/N	Items	Number	%
1	Quantity sampling	391	%
2	Quantity of completed and duly returned	346	88.5%
3	Quantity received but incompletely filled	11	2.8%
4	Quantity of unresponsive respondents	34	8.7%
Total	391		100%

Source: Fieldwork, 2024

Three hundred and Ninety-One (391) questionnaire were distributed to selected populations both in Kwara, Kogi and Niger States; thirty-four (34) participants in all were unable to be contacted. Out of the 391 questionnaires that were administered; three hundred and fifty-seven (357) were successfully retrieved but three hundred and forty-six (346) questionnaires were correctly and accurately completed.

Table 3: Demographic Characteristics of Respondents

Gender	Frequency	Percentage
Female	346	100%
Total	346	100%
Age	Frequency	Percentage
30-40	93	26.9%
41-50	174	50.3%
51-60 Above	79	22.8%
Total	346	100%
Education	Frequency	Percentage
FSLC/SSCE	158	45.7%
ND/NCE	110	31.8%
HND/B.Sc	78	22.5%
Total	346	100%

Source: Fieldwork, 2024

The above table indicates that there is an overwhelming number of female respondents. The table shows a hundred per cent (100%) of females because this research work is about women entrepreneurs. It is equally indicated on the table, the age group of the respondents: the figure indicates that individuals between the ages of 30 - 40 years widely

represent with a response of twenty-six point nine per cent (26.9%). An individual between the age of 41 - 50 years constitutes most of the responses in this survey with fifty point three per cent (50.3%) while twenty-two point eight per cent (22.8%) represents individuals between the ages of 51-60 years and above. The table also displays the educational qualifications of the respondents; most of the respondents have qualifications up to the university and polytechnic levels. Forty-five point seven per cent (45.7%) and Thirty-one point eight per cent (31.8%) hold FSLC/SSCE and NCE/ND respectively while twenty-two point five per cent (22.5%) respondents hold HND/B.Sc. This section examines how indigenous entrepreneurial activities, such as the production of peanut cake (Kuli-Kuli) and Handwoven Cloth (Aso-Ofi), contribute to poverty alleviation among rural women in North-Central Nigeria. Additionally, it addresses the specific constraints faced by these entrepreneurs and evaluates the successes; and limitations of poverty alleviation programs like GEEP and NSIP in empowering them. The twelve (12) research questions were tailored to seek information from the respondents about their opinions on the issue of entrepreneurial activities.

Table 4, Key: SA (Strongly Agreed), A (Agreed), U (Undecided), D (Disagreed), SD (Strongly Disagreed)

How do Indigenous Entrepreneurial activities, such as producing Peanut-Cake (kuli-kuli) and Handwoven Cloth (Aso Ofi) etc, Contribute to Poverty Alleviation among Rural Women in North-Central Nigeria?								
S/N	Statement	SA	A	U	D	SD	Total	Aggregate Response
		5	4	3	2	1		
1	Producing peanut cakes (kuli-kuli) has significantly increased the income levels of rural women in North-Central Nigeria.	115 (33.3%)	128 (36.9%)	30 (8.7%)	38 (10.9%)	35 (10.2%)	346 (100%)	Agreed
2	Handwoven cloth (Aso-Ofi) production provides rural women in North-Central Nigeria with sustainable employment opportunities.	94 (27.1%)	120 (34.7%)	9 (2.6%)	66 (19.1%)	57 (16.5%)	346 (100%)	Agreed
3	The skills required for Indigenous crafts like Aso-Ofi weaving are easily accessible to rural women in North-Central Nigeria, contributing to their economic empowerment	101 (29.2%)	132 (38.1%)	14 (4.1%)	46 (13.3%)	53 (15.3%)	346 (100%)	Strongly Disagreed
4	Indigenous entrepreneurial activities in North-Central Nigeria play a crucial role in reducing poverty among rural women.	103 (29.8%)	101 (29.2%)	27 (7.8%)	64 (18.5%)	51 (14.7%)	346 (100%)	Strongly Agreed
What are the Specific Constraints faced by Rural Women Entrepreneurs in North-Central Nigeria?								
5	Limited access to capital and credit is not a major barrier for rural women entrepreneurs in North-Central Nigeria	57 (16.5%)	47 (13.6%)	9 (2.6%)	122 (35.3%)	111 (32%)	346 (100%)	Disagreed
6	Cultural and gender norms do not restrict the entrepreneurial opportunities available to rural women in North-Central Nigeria	77 (22.2%)	47 (13.5%)	23 (6.7%)	86 (24.9%)	113 (32.7%)	346 (100%)	Strongly Disagreed
7	Lack of education and vocational skills does not limit the effectiveness of rural women entrepreneurs in managing and growing their businesses	56 (16.2%)	62 (17.9%)	19 (5.5%)	107 (30.9%)	102 (29.5%)	346 (100%)	Disagreed
8	Limited access to broader markets is a significant challenge for rural women entrepreneurs in North-Central Nigeria	93 (26.9%)	109 (31.5%)	28 (8.1%)	61 (17.6%)	55 (15.9%)	346 (100%)	Agreed
What are the Successes and Limitations of Poverty Alleviation Programmes like GEEP and NSIP in Empowering Rural Women Entrepreneurs in North-Central Nigeria?								
9	The Government Enterprise and Empowerment Program (GEEP) has not significantly improved access to financial resources for rural women entrepreneurs in North-Central Nigeria	102 (29.5%)	118 (34.1%)	11 (3.1%)	59 (17.1%)	56 (16.2%)	346 (100%)	Agreed
10	The National Social Investment Program (NSIP) has effectively provided training and skills development for rural women entrepreneurs in North-Central Nigeria	59 (17.1%)	43 (12.4%)	24 (6.9%)	114 (32.9%)	106 (30.7%)	346 (100%)	Disagreed
11	The NSIP has successfully increased market opportunities for products and services offered by rural women	29 (8.4%)	33 (9.6%)	37 (10.7%)	128 (36.9%)	119 (34.4%)	346 (100%)	Disagreed

entrepreneurs in North-Central Nigeria.									
12	The Government Enterprise and Empowerment Program (GEEP) has effectively addressed the challenges faced by rural women entrepreneurs in North-Central Nigeria	34 (9.8%)	48 (13.9%)	9 (2.6%)	113 (32.6%)	142 (41.1%)	346 (100%)	Strongly Disagreed	

Source: Fieldwork, 2024

4. Discussion of Findings

The above table demonstrates affirmation responses regarding the opinions of respondents on Producing peanut cake (kuli-kuli) has significantly increased the income levels of rural women in North-Central Nigeria. However, the above table showed the first statement that 33.3% + 36.9% = 70.2% Agreed while 10.9% + 10.2% = 21.1% Disagreed on the first statement posed to respondents which interprets that Producing peanut cake (kuli-kuli) significantly increased the income levels of rural women in North-Central Nigeria. The finding shows empowering women through entrepreneurial skills development would enhance their economic standing.

Handwoven cloth (Aso-Ofi) production provides rural women in North-Central Nigeria with sustainable employment opportunities: The second statement in Table 4 above showed affirmative responses about respondents' opinions on how Handwoven cloth provides sustainable employment opportunities. The quantitative outcome demonstrated that 27.1% + 34.7% = 61.8% Agreed while 19.1% + 16.5% = 35.6% Disagreed which interprets that handwoven cloth (Aso-Ofi) production provides rural women in North-Central Nigeria with sustainable employment opportunities. Supporting this quantitative outcome. Oluwakemi Adesina (2019) highlights traditional textile production, such as the handwoven Aso-Ofi cloth, plays a crucial role in the livelihoods of rural communities in Nigeria. Adesina argues that this craft not only preserves cultural heritage but also offers a viable source of income, particularly for women.

The skills required for indigenous crafts like Aso-Ofi weaving are easily accessible to rural women in North-Central Nigeria, contributing to their economic empowerment: The quantitative results revealed that 29.2% + 38.1% = 67.3% Agreed with the statement while 13.3% + 15.3 = 28.6% Disagreed which means indigenous crafts like Aso-Ofi weaving contributing to economic empowerment. Moreover, in a study by Okeke and Musa (2018), it was found that the employment generated by traditional crafts, such as Aso-Ofi, is sustainable due to its reliance on locally sourced materials and the high demand for culturally significant textiles. This sustainability is further

bolstered by the intergenerational transfer of skills, ensuring that the craft continues to provide employment opportunities across different age groups within rural communities.

Indigenous entrepreneurial activities in North-Central Nigeria play a crucial role in reducing poverty among rural women: The quantitative results revealed that 29.8% + 29.2% = 59% Agreed with the statement while 18.5% + 14.7% = 33.2% Disagreed which means Indigenous entrepreneurial activities in North-Central Nigeria play a crucial role in reducing poverty among rural women. Empowering women through entrepreneurial skills development not only enhances their economic standing but also drives broader community development. Studies have shown that women re-invest up to 90% of their income into their families and communities, compared to 30-40% by men (Adewale, 2019).

Limited access to capital and credit is not a major barrier for rural women entrepreneurs in North-Central Nigeria: The fifth statement in Table 4 showed affirmative responses pertaining to respondents' opinions on the limited access to capital and credit to rural women entrepreneurs in North-Central, Nigeria 16.5% + 13.6% = 30.1% Agreed while 35.3% + 32% = 67.3% which demonstrate that rural women entrepreneurs in North-Central don't have adequate access to capital and credit to support their businesses. Supporting this quantitative outcome. Afolabi (2015) says women in rural North-Central Nigeria are integral to the local economy, often engaged in agriculture, trading, and small-scale enterprises. Despite their significant contributions, they face substantial barriers, including limited access to credit, education, and training (Afolabi, 2015).

Cultural and gender norms do not restrict the entrepreneurial opportunities available to rural women in North-Central Nigeria: The quantitative results revealed that 22.2% + 13.5% = 35.7% Agreed with the statement while 24.9 % + 32.7 = 57.6% Disagreed which means Cultural and gender norms restrict the entrepreneurial opportunities available to rural women in North-Central Nigeria. Moreover, in a study by Ayoade (2016) highlighted that deep-rooted gender norms and societal expectations limit women's

participation in economic activities and decision-making processes, reducing the overall impact of entrepreneurial initiatives. There is also a shortage of targeted entrepreneurial training programs that address the specific needs and contexts of rural women, hindering their ability to effectively manage and expand their enterprises

Lack of education and vocational skills does not limit the effectiveness of rural women entrepreneurs in managing and growing their businesses: The seventh statement in Table 4 above showed affirmative responses about respondents' opinions on Lack of education and vocational skills. The quantitative outcome demonstrated that $16.2\% + 17.9\% = 34.1\%$ Agreed while $30.9\% + 29.5\% = 60.4\%$ Disagreed which interprets that lack of education and vocational skills limit the effectiveness of rural women entrepreneurs in managing and growing their businesses. Despite their significant contributions, they face substantial barriers, including limited access to credit, education, and training (Afolabi, 2015). Empowering these women through entrepreneurial skills development not only enhances their economic standing but also drives broader community development.

Limited access to broader markets is a significant challenge for rural women entrepreneurs in North-Central Nigeria: The quantitative results revealed that $26.9\% + 31.5\% = 58.4\%$ Agreed with the statement while $17.6\% + 15.9\% = 33.5\%$ Disagreed which means limited access to markets is a significant challenge for rural women entrepreneurs in North-Central Nigeria. Rural women entrepreneurs, often have less access to productive resources, markets, education, and decision-making processes compared to their male counterparts and urban women.

The Government Enterprise and Empowerment Program (GEEP) has not significantly improved access to financial resources for rural women entrepreneurs in North-Central Nigeria: The quantitative results revealed that $29.5\% + 34.1\% = 63.6\%$ Agreed with the statement while $17.1\% + 16.2\% = 33.3\%$ Disagreed which means the Government Enterprise and Empowerment Program (GEEP) has not significantly improved access to financial resources for rural women entrepreneurs in North-Central Nigeria. However, Indigenous Women Entrepreneurs do not benefit significantly from government policies. The effectiveness of poverty alleviation programs, such as the Government Enterprise and Empowerment Program (GEEP) and the National Social Investment Program (NSIP), is hindered by various challenges, including inadequate

infrastructure, cultural resistance, and the lack of a supportive ecosystem for entrepreneurs (Chukwu, 2017).

The National Social Investment Program (NSIP) has effectively provided training and skills development for rural women entrepreneurs in North-Central Nigeria: The tenth statement in Table 4 above showed affirmative responses about respondents' opinions on the National Social Investment Program (NSIP). The quantitative results revealed that $17.1\% + 12.4\% = 29.5\%$ Agreed with the statement while $32.9\% + 30.7\% = 63.6\%$ Disagreed which means that National Social Investment Program (NSIP) has not effectively provided training and skills development for rural women entrepreneurs in North-Central Nigeria.

The NSIP has successfully increased market opportunities for products and services offered by rural women entrepreneurs in North-Central Nigeria: The quantitative results revealed that $8.4\% + 9.6\% = 18\%$ Agreed with the statement while $36.9\% + 34.4\% = 71.3\%$ Disagreed which means NSIP has not successfully increased market opportunities for products and services offered by rural women entrepreneurs in North-Central Nigeria. Supporting this quantitative outcome.

The Government Enterprise and Empowerment Program (GEEP) has effectively addressed the challenges faced by rural women entrepreneurs in North-Central Nigeria: The twelfth statement in Table 4 above showed affirmative responses about respondents' opinions on the Government Enterprise and Empowerment Program (GEEP). The quantitative results revealed that $9.8\% + 13.9\% = 23.7\%$ Agreed with the statement while $32.6\% + 41.1\% = 73.7\%$ Disagreed which means the Government Enterprise and Empowerment Program (GEEP) has not effectively addressed the challenges faced by rural women entrepreneurs in North-Central Nigeria.

5. Conclusion

The survey results highlight the limited benefits of indigenous entrepreneurial activities for rural women in North-Central Nigeria. Despite the engagement in producing peanut cake (kuli-kuli) and handwoven cloth (Aso-Ofi), which were expected to boost income and employment, only marginal improvements were observed. Although 70.2% and 61.8% of respondents indicated participation in these activities, the overall economic uplift was not as significant as anticipated. This contrasts with the findings of Adewale (2019) and Adesina (2019), who stressed the importance of

traditional crafts for economic and cultural growth, as well as reinvestment into communities.

Challenges persist, particularly in the areas of access to capital and credit, with 67.3% of respondents acknowledging these as major barriers. Restrictive cultural norms further impede progress, as noted by 57.6% of respondents. Government initiatives like the Government Enterprise and Empowerment Program (GEEP) and National Social Investment Program (NSIP) have failed to make a meaningful impact, with 63.6% and 71.3% of respondents, respectively, stating that these programs did not effectively address the core challenges faced by Indigenous women entrepreneurs. These findings suggest that more targeted and effective support mechanisms are essential for genuine economic empowerment

6. Recommendations

The following recommendations draw from both the survey findings and relevant academic literature:

- To facilitate better access to credit and capital for women entrepreneurs in rural areas, the federal government should create customized financial support programs.
- To assist rural women in running and growing their enterprises, the Federal Ministry of Labor and Employment should implement training courses in financial literacy, business management, and fundamental entrepreneurial skills.
- Through digital platforms and market links, initiatives should be developed to assist rural women entrepreneurs who produce kuli-kuli and Aso-Ofi in expanding their market reach.
- To better serve the unique needs of rural women entrepreneurs, the Federal Ministry of Humanitarian Affairs, Disaster Management, and Social Development ought to examine and improve government initiatives like GEEP and NSIP.
- In order to promote equality and inclusive growth, laws and programs that challenge gender and cultural norms that restrict women's entrepreneurial prospects should be put into place.

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Road Transport Infrastructure and Traffic Density in Kano Metropolis, Nigeria

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Abstract. A major Nigerian urban centre, Kano Metropolis, deals with serious road traffic problems that lead to frequent congestion and delays. Although most research focusses on traffic flow and volume problems, it rarely addresses the role that vehicle noncontact conflicts play in traffic flow, given the type of infrastructure. The purpose of this study was to find whether road infrastructure affected vehicular traffic conflicts in Kano Metropolis, Nigeria. To meet its objectives, the study used statistical modelling. This research assessed how different ancillary road infrastructures affected travel time and traffic patterns using linear regression models. Primary sources provided data; these included traffic counts, road network maps, and field observations on sixteen main highways. The average travel time on roads served as the dependent variable, and evaluated traffic node clustering using node distribution and traffic volume analysis. The results of the study showed that Kano Metropolis's Road network connection was usually inadequate, with notable gaps between main routes. The model only explained 23.5% of the variance in average travel time on the Kano metropolitan road network, according to the regression study. It also indicated the existence of bus stops statistically influencing average travel time and pedestrian bridges ($p = 0.037$). Other factors, such as traffic lights ($p = 0.208$), overhead bridges ($p = 0.656$), laybys ($p = 0.087$), and speed bumps ($p = 0.296$), did not significantly influence travel time on the main Kano highways. In essence, the study showed that improving road infrastructure especially in terms of connection and the strategic placement of ancillary buildings, can greatly reduce traffic conflicts and enhance traffic flow in Kano Metropolis. Future urban design projects should prioritise building traffic lights at important intersections for the development of pedestrian bridges and overhead bridges, thereby enhancing connectivity.

Keywords: Infrastructure, Road network connectivity, Traffic conflict, Traffic congestion, Travel time

1. Introduction

Globally, transport systems are the backbone of urban and rural development, supporting environmental sustainability, social advancement, and economic prosperity. Whether through roads, railways, airways, or waterways, efficient transportation systems which link people, goods, and services across various regions, thus supporting trade and economic activities by means of their fundamental connectivity (Usman & Sani, 2022). Vinod *et al.* (2003) claim that the effectiveness of transportation systems directly affects the rate and extent of urbanisation and industrialisation, thereby determining the spatial and economic landscape of cities. According to Ademiluyi & Solanke (2007) transport is the foundation of city operation. Consequently, since it promotes regional and worldwide trade and integration, transportation is not just a basic utility but also a major driver of globalisation. Particularly in developed countries, the ongoing worldwide investment in transportation networks emphasises their non-negotiable nature in preserving competitiveness in the global economy (Solanke, 2013; Rodrigue *et al.*, 2020).

In industrialised nations, robust transport systems are closely associated with sustainable urban development, improved living standards, and reduced access inequality. As countries develop, the need for modern and effective transport networks becomes increasingly evident. Modern transport systems lower travel time, increase general quality of living, and boost productivity. Similarly, we cannot emphasise how important transportation infrastructure is to underdeveloped nations, such as Nigeria. Expanding

urban centres and fast-rising populations create demand for transportation systems that can manage the complexity of urban mobility while promoting economic development and integration. In order to close the rural-urban divide and guarantee inclusive access to markets, goods, and services, transport networks in these areas are absolutely essential (Dam *et al.*, 2021).

The social development of developing nations depends critically on transport systems that provide required linkages for trade, mobility, and regional integration. In Nigeria, several forms of transportation, including rail, water, air, and road have various functions in both national and local development. Although historically rail transport was important for delivering bulk products over long distances, the sector has suffered from decades of neglect and under investment, reducing its current efficiency. Because of poor infrastructure and navigational difficulties, water transportation, which is beneficial throughout Nigeria's rivers and coastal areas for goods, particularly agricultural products, remains underdeveloped.

Conversely, air transport is a vital link between regions and, globally, offers a rapid substitute for long-distance travel. However, air transport mostly manages passenger travel and high-value products, thereby providing little help for daily urban mobility (Ibrahim & Bello, 2022). In Nigeria, road transport still dominates all other modes of transportation, notwithstanding these alternatives.

Nigeria, being the most populated country in Africa depends mostly on its transportation system to connect its several regions. The transport system, which consists of roads, rail, air, and waterways, is essential in allowing the flow of goods and services throughout the country. Among these modes, road transport dominates, it accounts for more than 90% of both passenger and freight movements (National Bureau of Statistics, 2022). With almost 200,000 kilometres, the vast Nigerian road network is absolutely essential for regional trade, national cohesion, and economic integration. Routes are like critical arteries linking metropolitan centres with rural areas, therefore enabling necessary connections between production and consuming centres. Nevertheless, the condition and capacity of the road network significantly influence its effectiveness and ability to promote economic development.

Road transport, which facilitates the movement of people and goods across diverse geographic landscapes, is a major component of global transportation systems. Road transport, the most

commonly used form of mobility, facilitates regional integration and development, provides access to basic amenities, and stimulates economic activity. Globally, road connections are quite important for the functioning of economies since they are main commerce routes between cities as well as countryside parts and help to link them. Countries all over the world invest heavily in building, developing, as well as maintaining their road systems, demonstrating the significance of road transport. Roads enable nearly 80% of world passenger and goods movement, according to the World Bank (2021), therefore highlighting the sector's importance in the global economy.

National road transport infrastructure plays a crucial role in linking many areas, encouraging domestic trade, and enabling people's mobility. Road travel is especially important in many developing nations due to the underdevelopment of other modes of transportation, such as rail and air. For both intra as well as inter-state journeys in Nigeria, road transport is the most often used form of mobility. It provides access to basic goods and serves as a trading hub between Nigerian states and surrounding nations. By guaranteeing the movement of goods and people, road transport promotes trade, increases production, and enables social contact. However, the state of road infrastructure directly impacts the quality and efficiency of transport services, thereby significantly influencing their efficacy. Although road networks in cities like Lagos, Kano, and Port Harcourt are vital for economic development, the infrastructure supporting them sometimes remains insufficient, which results in congestion, road vehicular traffic conflicts, and inefficiencies.

Though it presents many difficulties, Nigerian road infrastructure is absolutely vital for the country's GDP. Roads, bridges, and highways, among other aspects of transportation infrastructure, build the basis of social and economic growth. By allowing seamless transit and thereby lowering travel time, well-maintained road networks greatly support regional integration, urban growth, and economic development (Takyi, Kofi, & Anin, 2013).

A major problem with broad consequences for road safety in Nigeria and transportation efficiency is road traffic conflict. Traffic conflicts occur when the actions of road users whether drivers, cyclists, or pedestrians intersect in a way that could result in a collision if no changes are made to their movements (Adegboye & Olanrewaju, 2023). These conflicts, which are common in crowded metropolitan contexts, can include merging conflicts, rear-end conflicts, crossing conflicts, and lane-change conflicts.

According to the World Health Organization (2022), traffic accidents, which mostly affect low- and middle-income nations like Nigeria and Ghana, are among the top causes of death worldwide; road traffic conflicts are thus a major factor causing traffic accidents.

According to Ghazali *et al.* (2021), the degree of congestion and the effectiveness of traffic management strategies, such as traffic lights, signage, and road markings, primarily influence urban road traffic conflicts. Many Nigerian cities have had regular accidents, traffic congestion, and a high frequency of road user deaths from inadequate road traffic system management.

2. Literature Review

Sheykhfard *et al.* (2023) conducted a traffic conflict analysis that included right-turning vehicles at unsignalised junctions in suburban settings. An instrumental vehicle study gathered driving behaviour data to offer a comprehensive analysis of the elements controlling the safety of right-turn manoeuvres. The researchers used this data to identify the parameters influencing the risk of vehicle-vehicle (V-V) and vehicle-pedestrian (V-P) conflicts during right-turn stage movements at six suburban crossroads in Babol, Iran. The data analysis revealed a total of 1,456 VV and VP disputes. Linking vehicle speed, the distance between road users, and driver and pedestrian delays, the logistic regression model identified higher danger in vehicle-to-vehicle or vehicle-to-pedestrian confrontations. Researchers developed a linear regression model to forecast, during several phases of the right turn, including the commencement, along with completion of the movement, the safe right-turn speeds drivers should utilise. The results showed that drivers adjusted their behaviour in the same manner against pedestrians as they did toward cars.

Jiawei, Essan, & Hatem (2021) used microsimulation to investigate the analysis of pedestrian-vehicle conflict at signalised junctions. The purpose of the study was to determine whether the Surrogate Safety Assessment Model (SSAM) and the VISSIM simulation model could produce reasonable forecasts for pedestrian-vehicle collisions along signalized intersections. The study covered two types of pedestrian-vehicle conflicts: pedestrian-yielding vehicle and vehicle-yielding pedestrian. They gathered field data using seven signalised junctions and recorded 42 hours. Researchers generated pedestrian-vehicle conflicts using the calibrated and verified VISSIM model, then extracted these conflicts from the vehicle trajectory file using the SSAM program. Using the mean absolute percent error

(MAPE), they established the maximum TTC and PET thresholds for pedestrian-vehicle interactions. The study found that setting the maximum TTC threshold to 2.7 and the maximum PET threshold to 8 produced the best goodness-of-fit between generated and actual conflicts. Using a linear regression, they looked at the relationship between the simulated conflicts from the micro-simulation and the real-world conflicts seen on the field. The study turned up a clear statistical association between the simulated and real conflicts. The VISSIM model, the researchers also discovered, understated the count of pedestrian-vehicle incidents. One reasonable theory for this could be the VISSIM simulation's incapacity to create real-world pedestrian-vehicle conflicts involving illegal pedestrian actions, including red-light violations.

Using UAV video data, Lu *et al.* (2023) investigated the lane-change conflict between vehicles and trucks in the merging sector. Analysing conflicts between several vehicle kinds in the portion of the highway merging was the primary aim of the study. An unmanned aerial vehicle (UAV) gathered field data in Shanghai, China's merging zones. The vehicle extraction technique is used to derive the vehicle trajectories. The surrogate safety measure was time-to-collision (TTC). TTC of truck-truck clashes was the highest; TTC of car-car conflicts was the smallest. Traffic issues often arise at the on-ramp and acceleration lane. The data showed a notable variation in the spatial distribution of lane-change conflicts between various vehicle types, suggesting that drivers especially those in cars should keep a reasonable distance. Moreover, traffic management authorities should think about modifying the dotted line to a solid lane at the beginning of the accelerating lane in order to lower lane-change problems in the merging region.

Under diverse and weak lane-discipline traffic, Heral *et al.* (2023) investigated a new traffic conflict-based paradigm for real-time traffic safety evaluation. The work suggested a macroscopic flow-variable real-time traffic safety evaluation system. They used extended vehicle trajectories under open access. They produced macroscopic traffic flow characteristics and rear-end traffic conflicts from the trajectory data and then incorporated them for a real-time safety evaluation. Since the proportion of stopping distance (PSD) considers all kinds of contacts - both safe and dangerous - in the traffic flow, researchers used it to investigate rear-end traffic conflicts. To assess the rear-end traffic disputes, a macroscopic indicator named "time spent in conflict (TSC)" was developed. They utilized machine learning techniques, particularly random forests (RF). Researchers projected TSCs using macroscopic traffic flow

variables using Support Vector Machines (SVM) and Extreme Gradient Boosting (XGB). The results demonstrated a consistent and reasonable relationship between the TSC calculated based on PSD and the macroscopic traffic flow characteristics. The TSC computation based on PSD revealed that safety depends much on the somewhat crowded traffic flow conditions. Complicated traffic phenomena, including traffic hysteresis, traffic oscillations, and additional speed changes, produce these situations. Moreover, the study indicated a consistent link between traffic flow and safety for different threshold values.

Mesenbet *et al.* (2024) conducted a community-based cross-sectional study examining road traffic accidents and the contributing reasons among public transport users in Mizan Aman town, Ethiopia. The study aimed to assess drivers of public transport in Mizan Aman town's frequency of road traffic accidents and their respective contributing factors. Researchers carried out a grassroots longitudinal study among 376 public transport pilots. They selected each study using a simple random selection technique. Semi-structured, open-ended questionnaires provided data on demographic characteristics, risky personal behaviours and lifestyles, driving factors, vehicle condition, and environmental conditions. The interviewer then compiled the information using KoBo Collect tools. Following data modification and cleaning in the Kobo Collect toolkit. Descriptive data were presented using figures, tables, and words. In search of the influential factors, researchers looked at binary logistic regression. The statistics show that public transport drivers in Mizan Aman town had a 17% incidence of road traffic accidents. The study revealed a number of elements influencing traffic accidents on the road: marital status (single), employment status (permanent), monthly income (1001–2500 Ethiopian Birr), alcohol use, car maintenance (none), road type (not asphalt), and weather conditions (being windy).

Using the Traffic Conflict Parameter Technique, Muhammad *et al.* (2022) investigated the traffic performance study on unmarked crossings. The purpose of this study is to examine at an unmarked intersection the degree of service, the kind of conflict, and the traffic complexity. Researchers gathered primary information on the conflict strategy and traffic volume using the field survey approach. With a DS value of 1.06 and LOS F, the research revealed that 3,810 passenger automobiles per hour accounted for the maximum traffic volume. During the peak one-hour observation period, 420 disagreements occurred. In 138 cases, the majority of the confrontations resulted in straight-right turn motions.

Using a broad approach, Lizarazo (2020) examined tracking system failure-caused traffic conflict identification. This effort primarily focused on developing a general case framework for traffic conflict identification. Researchers tested and assessed this framework to show its relevance in developing tracking technologies using area-wide detection systems and in-vehicle sensors. When comparing the observed crashes with the expected number of crashes, they found that the controlled environments from naturalistic driving studies offered a unique opportunity to evaluate the discovered conflicts. Moreover, researchers projected the potential crash intensity depending on a given conflict using statistical methods. This paradigm offers a potential approach to optimize current data sources and assess road safety based on traffic conflicts rather than collisions.

Using a new Baneshwar intersection as a case study, Abhash & Ani (2020) investigated traffic conflict prediction at signalized crossings. The work showed how to use VISSIM and SSAM to project vehicle interactions at the New Baneshwar Intersection. They calculated the projected daily counts of probable lane changes, rear-end crashes, and crossings as 1, 9, and 945, respectively. With R-squared values of 0.8545, 0.7474, 0.88677, and 0.99138 for crossing, lane-changing, rear-end, and overall conflicts, respectively, the simulated and observed conflicts displayed a statistically significant association. They observed that designing traffic signals based on changing traffic volume rather than applying a fixed-time traffic signal can significantly reduce the frequency of crossings, lane changes, and rear-end incidents by a maximum of 88%, 40%, and 39%, respectively.

Ram (2020) looked at significant elements of human behaviour in road traffic accidents. The study sought to pinpoint more general human activities as well as socio-demographic and environmental elements linked to road traffic accident risk. The study revealed a close correlation between a risk of road traffic accidents and elements including young age, male gender, speed, influence of drugs, use of mobile phones, driving experience, temperament, attitude, aggression, stress, anxiety, emotional expression, tiredness, lack of sleep, and road conditions. Professional drivers, such as bus and taxi drivers, are particularly vulnerable to road traffic accidents, despite possessing significant driving instruction and the necessary skills to operate motor vehicles.

Ebiai & Mgbeanuli (2023) examined driving behaviour and workplace stress as indicators of road traffic accidents in Borno State, Nigeria. The study took a cross-sectional survey approach. They gathered

information for this study using records and questionnaire distribution. The study involved a total of 87 participants. Based on documents from the police departments, hospitals, Federal Road Safety Commission, and National Union of Road Transport Workers, researchers purposefully sampled accident victims within the state. The analysis revealed that road traffic accidents in Borno State have no appreciable correlation with number of accidents ($r = .03$, $M = 19.3$ $p.05$) or age ($r = .03$, $M = 8.3$ $p.05$). Among Borno State drivers, work stress ($r = .24$, $M = 8.3$, $p < 0.05$), and driving behavior ($r = .49$, $M = 8.5$, p).

In Jalingo Metropolitan, Taraba State, Nigeria, Muhammad & Shamshudeen (2022) looked at risky behaviour in road traffic accidents among commercial vehicle drivers. The study applied a model of descriptive survey research. The population consisted of two thousand commercial vehicle drivers enrolled with the National Union of Road Transport Workers (NURTW). Researchers examined the null hypotheses under a 0.05 level of significance. The study advised the government and other pertinent organizations, including the Federal Road Safety Corps and Vehicle Inspection Officials (VIO), to plan regular seminars and enlightenment campaigns to inform commercial vehicle drivers about actions that might lead to road accidents. In addition, owners of commercial vehicles should not only select competent drivers but also ensure they refrain from engaging in dangerous activities that could potentially cause traffic accidents.

Ajiboye *et al.* (2020) investigated road traffic conflicts using the main gate T-junction at university of Benin. The study employed a survey approach to identify and classify traffic conflict and volume data at the intersection. The study employed one-way ANOVA to examine traffic volume variations, observing no significant change until the holiday season, when a distinct one emerged. The study's constructed model demonstrates that linear relations, with a coefficient of determination ranging from 0.47 to 0.76, significantly explain the relationship between traffic conflict and traffic volume. The study also revealed that temporal drum placement at the intersection helped to lower cross-merge and merge-merge-activated problems by preventing commercial drivers from cramming at the intersection. The study suggests appropriate countermeasures to improve traffic safety: zebra crossing, effective control over commercial drivers, identifying the minor road, giving signs and signals legible enough for operators, and so on.

Olaifa (2020) investigated the assessment of road network accessibility and traffic indexes using a case

study of Ondo State. He performed the road network analysis with the ArcGIS Network Analyst extension. In this study, researchers used a manual traffic count system, reporting counts on the count sheet, doing physical inspections, and counting the cars at the chosen centroids. The analysis revealed that the high road density of the studied area results in a significant degree of connectedness and an outstanding state of the road network.

Chinebuli, Samantha, & Lai (2019) carried out an observational study on dangerous behavior in Nigerian traffic conflicts. The study applied the TCT, or traffic conflict approach. At three separate sites in the eastern part of Nigeria, they compiled information by roadside observation. They used this approach to get over Nigeria's inherent problems with accessible, inadequate, and consistent crash data. Researchers documented 946 traffic conflicts overall, and statistical analysis revealed that the drivers had at least one risky action before the confrontations. Road user type, location, and time of day statistically linked with passenger scouting and other risky activities, while improper indication use (13.3%) and tailgating (11.3%) emerged as the most common risky actions. Tricycle operators were significantly more likely to engage in dangerous behaviour compared to drivers in other vehicles. Drivers on straight roads also have a higher tendency to act in a dangerous way. Moreover, they found a higher frequency of this dangerous behaviour during the busiest traffic times. To help improve traffic safety, experts suggest better regulations and enforcement, Nigerian road infrastructure improvements, and suitable road safety education.

3. Research Methodology

3.1 The Study Area

With a projected population of 4,490,734 million (NPC, 2024), Kano Metropolis, the major urban centre and business hub in Northern Nigeria, ranks second among all the cities in Nigeria after Lagos. Roads connect Kano to most surrounding states and African cities. Roads connect Kano with other communities in the Republic of Chad and Niger, facilitating the movement of large trucks, buses, and other vehicles (Bichi, 2018).

Kano City has a longitudinal coordinate between 8033'19.69 and 8031'59.690 E and an equatorial latitude between 11059'59.57 and 12002'39.570 N. Kano City is located on the north-central border of Nigeria, 1,140 miles from the Atlantic Ocean and 840 kilometres from the Sahara. Comprising eight Local

Government Areas (LGAs), the 499 square kilometre (193 square mile) city spans Dala, Kano Municipal, Fagge, Gwale, Nasarawa, Tarauni, Ungogo, and Kumbotso (Bichi, 2018). From the Kano urban region to the southwest, Madobi and Tofa's LGAs encircle Dawakin Kudu to the southeast, Gezawa to the east, and Minjibir to the north (see figure 1).

Kano, located in the northernmost region of the nation, is the capital of Kano State and a major centre of political, business, and cultural activity. With centuries of rich history, the city is currently well-known for its active economy, busy markets, and large road network linking it to other regions of Nigeria and surrounding nations. Comprising the metropolitan area of Kano, the study area offers a special mix of conventional and modern urban features that affect its road system and traffic flow.

The city's mostly flat top makes it ideal for building highways and other kinds of transportation systems. But Kano's Road system has been under great strain over the years from its rapid urbanization, population increase, and economic growth. With densely populated districts such as Dala, Fagge, Gwale, and the Sabon Gari neighbourhood, the city has developed into a vast metropolis. These districts, marked by small roads, informal settlements, and heavy pedestrian and vehicle traffic, stand in stark contrast to more recent, more ordered projects, like Nasarawa GRA and other affluent neighbourhoods, where road infrastructure is generally more developed.

Kano's strategic location as a commercial centre, especially for textiles and agricultural products has drawn local and foreign traders in great numbers. Particularly as heavy-duty vehicles, commercial buses, and informal transportation systems (such as

motorcycles and tricycles) converge in these areas to serve both traders and consumers, the city's vast market network - including Kurmi Market and Sabon Gari Market helps greatly to contribute to traffic congestion. Concentrating intercity and regional traffic, the Kano motor parks, Yankaba, Naibawa, and Kofar Ruwa also form vital nodes in the city's transportation infrastructure. Especially during peak hours and market days, these car parks provide notable traffic inflows and outflows that help explain the traffic complexity of the city.

Though somewhat vast, Kano Metropolis's Road system is quite diverse in quality. Relatively well-developed major arterial routes include Zaria Road, Airport Road, and Katsina Road, which have several lanes and improved traffic control systems. For the metropolis as well as for other areas of northern Nigeria, these highways are vital linkers. However, the interior roads, particularly in the older sections of the city, suffer from poor maintenance, inadequate signage, and a significant amount of traffic congestion. Furthermore, the high population density and business activity have outpaced the development of road infrastructure, leading to frequent traffic congestion and confrontations at intersections, particularly where roads intersect without proper traffic control systems.

Kano's environment affects traffic flow as well. The area has a clear wet and dry season; the rainy season (from June to September) usually results in road degradation, particularly in places lacking drainage systems. Particularly in low-lying parts of the city, flooding during the rainy season can seriously disturb traffic flow. By contrast, the dry season brings more dust and visibility problems that could compromise road safety.

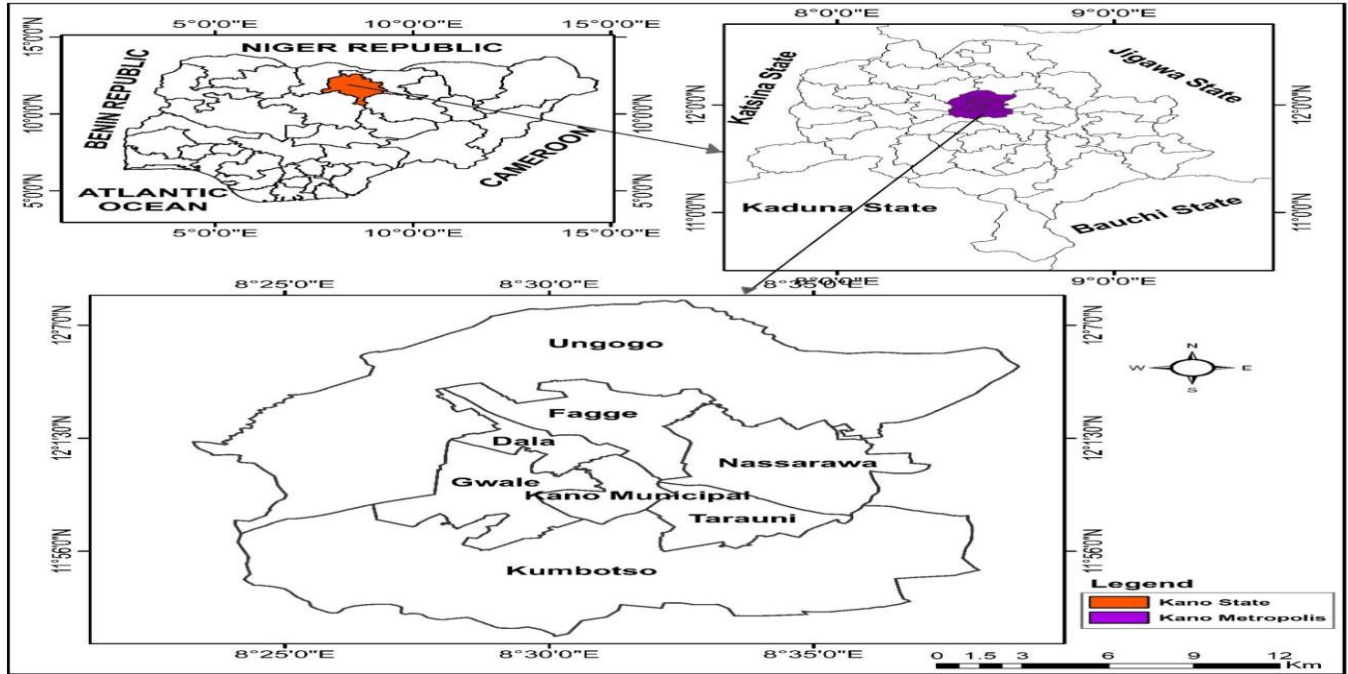


Figure 1: Kano Metropolis Nigeria
 Source: Author's Fieldwork, 2023

4. Results And Discussion

Table 1: Road Transport Infrastructure Characteristics and Traffic Density on Kano Roads

VEHICULAR TRAFFIC CHARACTERISTICS ON MAJOR METROPOLITAN ROADS IN KANO						
ROAD	ROAD FEATURE		INFLOW		OUTFLOW	
	Average Travel time(m)	Road Length (m)	AVG. VEH.TRAFFIC	VEH. DENSITY/KM	AVG. VEH.TRAFFIC	VEH. DENSITY/KM
Kurna Babban Layi	10	4365	908	208	863	198
Hospital road	8	2023	302	149	289	143
BATA	9	2180	1210	555	1149	527
France road	13	1942	946	487	898	462
Kabuga road	13	1740	872	501	829	476
Gwarzo road	16	3992	608	152	577	145
Kanar Ungogo	19	4955	365	737	347	70
Zoo Road	6	2380	1092	459	1038	436
Zaria Road	9	3515	981	279	921	262
Ibrahim Road	8	1425	1152	804	1094	768
BUK Road	10	1575	849	539	808	513
Post office Road	33	792	667	842	633	799
Hadejia	32	2990	969	324	921	308
Club Road	39	850	715	841	680	80
Maiduguri Road	29	3435	1071	312	1018	296
Zaria Road	39	3292	1019	310	968	294

Table 2 shows the results of the regression model. With an R-value of 0.769 overall, the model shows a rather acceptable correlation between the chosen infrastructure factors and average travel time along the 16 main roadways in Kano. But the R-squared value of 0.592 showed that these building components accounted for about 59.2% of the variance in average journey time. Notwithstanding this, the modified R-squared is much lower at 0.235, suggesting that, considering the model's number of predictors, the independent variables' explanatory power is 23.5%. This implies that the model ignores 76.5% of the influencing elements.

The constant term (B = 10.500) reflects the baseline travel time on Kano's metropolitan roadways, while all other factors remain constant. The presence of pedestrian bridges as a variable has a significant negative coefficient (B = -27.714, p = 0.037), meaning that their presence often greatly lowers travel time. The negative indicator suggests that pedestrian bridges could potentially alleviate traffic congestion by reducing pedestrian interference with vehicle traffic, thereby enhancing traffic flow and reducing conflicts at road crossings.

Conversely, the impact of traffic signs appears to be quite minimal, with an unstandardized coefficient of $B = -2.286$ and a p-value of 0.769. This insignificance suggests that road signs, despite their intended use in traffic direction, have no effect on travel times or on vehicle traffic conflicts on the Kano metropolitan road system. Either poor signage placement or a lack of road users' adherence could help explain the result.

The results also indicate a positive correlation ($B = 11.643$, $p = 0.208$) between the presence of traffic signals and longer travel times. However, note that this result is a chance occurrence rather than a certainty. The good connection could point to functional problems with this collection of city auxiliary facilities. Structure inside the city. Though the outcome is not statistically significant, the existence of overhead bridges also has a positive coefficient ($B = 3.786$, $p = 0.656$). This effect is therefore once more a chance occurrence. The lack of statistical significance for both traffic lights and overhead bridges suggests that both systems, although meant to improve road safety and lower conflicts, may need more research on their likely impact.

The presence of road lay-bys, while not statistically significant at traditional thresholds, exhibits a positive coefficient ($B = 16.214$) with a p-value of 0.087, suggesting a slight effect on travel time.

Although the p-value (0.296) indicates that their impact on traffic performance is a chance event, not statistically significant, the data also show a notable positive effect of speed breakers ($B = 21.929$). The high coefficient of the variable indicated that speed breakers, meant to slow down traffic and a main cause of induced conflict, might drastically slow down movement and thereby increase the journey time. Nonetheless, as shown by the non-significant p-value, their uneven distribution throughout important road networks could have a considerable impact over the sampled locations.

Finally, we found that the presence of bus stops and ancillary road infrastructure significantly reduces travel time ($B = -30.357$, $p = 0.051$), almost reaching statistical significance. The results showed a significant negative coefficient, suggesting that bus stops on Kano Metropolitan roads exacerbate traffic congestion and delays.

With a p-value of 0.247 and an overall F-value of 1.656, the ANOVA test for the model indicated that it is not statistically significant at the traditional 5% level. This outcome revealed that although individual infrastructure elements like pedestrian bridges and bus stops appear to influence travel time, the collective model does not provide sufficient data to indicate that these varied effects have a statistically significant impact on the average travel time on the 16 main roads of Kano Metropolis. This regression study revealed some significant variations in the way road infrastructure influences traffic performance, which arise from traffic congestion on the principal roadways of Kano Metropolis.

Table 2: Regression Result on Influence of Road Infrastructure on Traffic Performance

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.500	8.143		1.290	0.233
	Pedestrian bridge	-27.714	11.097	-0.798	-2.498	0.037
	Road signs	-2.286	7.539	-0.092	-0.303	0.769
	Traffic Light	11.643	8.498	0.470	1.370	0.208
	Overhead bridge	3.786	8.322	0.163	0.455	0.661
	Lay-bye	16.214	8.322	0.700	1.948	0.087
	Speed breaker	21.929	19.616	0.462	1.118	0.296
	Bus stop	-30.357	13.260	-0.874	-2.289	0.051
	Model Summary	R=0.769	R ² =0.592	Adjusted R ² = 0.235		
	ANOVA	F=1.657	P=0.247			

Dependent Variable: Average Travel time on kano roads
 Bus stop, Pedestrian bridge, Road signs, Traffic Light, Lay-bye, Overhead bridge, Speed breaker

Source: Author's Fieldwork, 2023

The Pearson correlation results reveal a weak correlation between the average travel time along roads within Kano Metropolis and any ancillary infrastructure. The overhead bridge, for instance, has a moderately negative correlation with travel time ($r = -0.489$, $p = 0.051$), suggesting that its presence might be associated with reduced travel time slightly, though this result is on the border of statistical significance. This indicates that overhead bridges could facilitate smoother vehicular traffic flow by reducing points of pedestrian-vehicle interaction, thereby reducing delays.

Interestingly, the presence of pedestrian bridges, traffic lights, speed breakers, bus stops, and roundabouts on selected roads within Kano Metropolis all exhibit weak to negligible correlations with travel time, none of which are statistically significant, except for one notable case. The presence of traffic lights exhibits a weak negative correlation ($r = -0.122$, $p = 0.652$), which suggests no substantial impact on travel time. Similarly, pedestrian bridges ($r = -0.329$, $p = 0.213$) also demonstrate a weak, non-significant correlation. These results imply that, in the context of Kano's metropolitan roads, pedestrian bridges and traffic lights may not substantially contribute to reducing travel time, perhaps due to their operational inefficiencies or because they are located on less congested roads where their impact is minimal.

Notably, the speed breaker shows a very weak correlation with travel time ($r = -0.052$, $p = 0.848$), indicating almost no relationship between their presence and travel time in this study. However, speed breakers demonstrate a significant positive correlation with bus stops ($r = 0.681$, $p = 0.005$), suggesting that roads with more speed breakers also tend to have more bus stops. Most often than not, speed breakers are placed near bus stops to reduce the risk of physical conflict between vehicles and enhance road safety, which makes sense for this pattern. There is also a positive correlation between the number of bus stops and roundabouts ($r = 0.567$, $p = 0.027$), which suggests that these two types of roadside infrastructure often coexist. This is especially true in areas with a lot of traffic, where both roundabouts and bus stops are necessary to control traffic and make room for public transportation.

On a more significant note, traffic lights and roundabouts show a moderate positive correlation ($r = 0.526$, $p = 0.036$), suggesting that roads with more traffic lights also tend to have more roundabouts. Areas with higher traffic density or intersections that require both types of infrastructure to manage vehicle flow may be the source of this correlation. Overall, the results suggest that while certain ancillary infrastructures like overhead bridges may slightly improve travel times, others like pedestrian bridges, traffic lights, and speed breakers do not exhibit a strong impact on average travel time. The findings point to the complex interplay between road design, infrastructure placement, and their functional effectiveness in mitigating traffic conflict and congestion on Kano's roads.

Table 3: Association Between Average Travel Time and Road Ancillary infrastructure

		Av. Travel Time	Pedestrian Bridge	Traffic Light	Overhead Bridge	Speed Breaker	Bus Stop	Round about
Av. Travel Time	Pearson Correlation	1	-0.329	-0.122	-0.489	-0.052	-0.191	0.193
	Sig. (2-tailed)		0.213	0.652	0.054	0.848	0.496	0.475
	N		16	16	16	16	15	16
Pedestrian Bridge	Pearson Correlation		1	-0.246	0.235	-0.113	-0.178	-0.350
	Sig. (2-tailed)			0.359	0.382	0.677	0.525	0.183
	N			16	16	16	15	16
Traffic Light	Pearson Correlation			1	0.124	-0.206	0.021	.526*
	Sig. (2-tailed)				0.648	0.444	0.940	0.036
	N				16	16	15	16
Overhead Bridge	Pearson Correlation				1	-0.305	0.219	0.120
	Sig. (2-tailed)					0.252	0.432	0.658
	N					16	15	16
Speed Breaker	Pearson Correlation					1	.681**	0.207
	Sig. (2-tailed)						0.005	0.442
	N						15	16
Bus Stop	Pearson Correlation						1	.567*
	Sig. (2-tailed)							0.027
	N							15
Roundabout	Pearson Correlation							1
	Sig. (2-tailed)							
	N							16

Source: Author's Fieldwork, 2023

5. Conclusion

In conclusion, addressing the challenges of road congestion and traffic conflicts in Kano Metropolis requires a multi-faceted approach that includes enhancing road connectivity, upgrading ancillary infrastructure, and improving traffic management systems. By implementing targeted interventions, such as expanding road networks, modernising traffic lights, and promoting public transport, Kano can improve urban mobility, reduce traffic delays, and foster sustainable development. This study provides a foundation for future research on transport infrastructure in urban centres, emphasising the importance of integrated planning and infrastructure investment to ensure efficient, conflict-free transportation networks.

6. Recommendations

The Kano State government has taken strong steps in the construction and maintenance of road transport infrastructure through direct investment and the creation of a Kano State traffic management agency to ensure the free flow of traffic. However, the metropolis still faces challenges related to vehicular traffic conflict, necessitating further action. Based on the study's findings, the researcher recommends the following measures for effective and efficient management of traffic conflict:

The rapid expansion of Kano Metropolis necessitates closer coordination between urban planning and road infrastructure development. The study recommends that future city planning incorporate transportation frameworks that accommodate growing residential areas and commercial hubs. By integrating new developments with appropriate road networks, we can minimise traffic congestion and vehicular traffic conflicts.

The state must systematically upgrade traffic light systems, particularly at key intersections, to ensure their functionality and efficiency. Introducing smart traffic light systems capable of adjusting to real-time traffic conditions would significantly reduce delays and improve the flow of vehicles. Kano State government should institutionalise regular maintenance and performance evaluations to prevent malfunctions that worsen traffic congestion.

Major arterial roads like France Road experience considerable bottlenecks, especially during peak hours. The study recommends the expansion of these key corridors to ease vehicular congestion. The state

should also develop alternative routes or bypasses to distribute traffic more evenly across the city.

The state should revisit the design of bus stops. Constructing well-designed lay-byes and off-road bus stops, particularly on major roads like BATA and Ibrahim Road, can improve the current configuration that frequently leads to traffic obstructions.

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Electoral Violence and Democratic Consolidation in Nigeria

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Abstract. This paper examines electoral violence and its implications for the consolidation of democracy in Nigeria. Having returned to democratic governance in 1999, Nigeria's elections have been marred by violence, thereby underscoring the tenets of free and fair elections and democratic consolidation. This paper identifies the causes, dynamic manifestations, and implications of electoral violence adopting the political economy as its theoretical framework for analysis. The paper concludes that, electoral violence constitutes a serious threat to the consolidation of democracy in Nigeria; as it undermines the electoral process, weakens public confidence in democratic institutions, and perpetuates a cycle of instability and mistrust. It also concludes that; the consolidation of democracy requires a multi-faceted approach in order to strengthen the autonomy and capacity of the Independent Electoral Commission (INEC) to ensure free and fair elections. Ultimately, the process to achieve democratic consolidation in Nigeria is a collective responsibility; where the political leaders, civil society, security agencies, and the entire populace must come together to reject violence and embrace the principles of democracy. It is only by ensuring that elections are deemed free, fair and peaceful that Nigeria can fully achieve the much-needed potential of democratic consolidation for its socio-economic development and national integration.

Keywords: Election, Democracy, Electoral Violence, Democratic Consolidation, Political Economy

1. Introduction

The use of violence to get access to political power has been a persistent prognosis in Nigerian politics since the first republic (1960-1966) and is trend-malady has not changed. Perpetual incidents of electoral violence in Nigerian political processes have forced many cynics to refer to electoral violence as part of the

country's political structure. Some common traits of electoral violence that manifested in Nigeria include the use of security agents and thugs to intimidate, disrupt and disperse voters, hijacking of elections materials and officials, political assassinations, clashes between rival political supporter groups, stuffing of ballot boxes, sporadic shooting of voters, destruction of elections materials, and many more audacious violent actions.

Elections in Nigeria since the advent of the fourth republic in 1999; and particularly the general elections of 2011, 2015 and that of 2019 have been marred by the spite of electoral violence. Elections are seen as the major ingredient of representative democracy. That is why Lindberg (2003) as cited in Adesote and Abimbola (2014) averred that:

Every modern version of representative democracy entails the notion of elections as the primary means of selection of political decision makers. Thus, it is incomprehensible in contemporary times to think of democracy without linking it to the idea and practice of elections.

Elections are an integral part of liberal democracy without which the notion of democracy will be an unrealistic hope or wish that cannot be achieved. Elections is a process in which candidates get elected into public offices. Elections are supposed to be free, fair and credible, and managed by an unbiased umpire so that the will of the majority will be upheld.

Elections constitute the central element of liberal democracy. This is because, elections confer legitimacy on political leadership. Thus, it is important to the consolidation of democracy. Elections confer citizens with the rights to choose their political leaders to make choices for them. Goodwin-Gill (2006), posits that, in any state, the authority of the government can only be derived from the will of the people through a

genuine, free and fair elections held at regular time frames based on the principle of universal, equal and secret suffrage.

Democratic elections are becoming an international norm. Governments gain legitimacy from such elections as they are receiving their power directly from the people. However, not all elections are democratic, nor are all elections that claim to be democratic are actually democratic. In many countries, election unfairness is the rule, violence on elections day is frequent, and claims of fraud are rampant (Goodwin-Gill, 2006). Election in post-colonial Nigeria became a fundamental game to win political power. Ironically, while there can be election without democracy, it is not possible to have democracy without election. This affirms the importance of election in the consolidation of democracy.

Interestingly, an estimated 20% of elections held globally experience some form of electoral violence of which the most frequent occurrences are found in South Asia and Africa (Burchard, 2015). Nigeria is one of the highly politically divided countries in Africa. The political class in Nigeria have since the advent of the fourth republic portrayed authoritarian tendency. Arguing on the above, Human Rights Watch noted:

Many of Nigeria's ostensibly elected leaders obtained their positions by demonstrating an ability to use corruption and political violence to prevail in sham elections. Using violent and brazenly rigged polls, government officials have denied millions of Nigerians any real voice in selecting their political leaders. In place of democratic competition, struggles for political office have often been waged violently in the streets by gangs of thugs-youths—recruited by politicians to help them seize control of power (2007:21).

Democracy has become mankind's most viable form of government, especially, after the United Nations Educational, Scientific and Cultural Organisation (UNESCO) survey of 1951 which indicated the popularity of democracy in Europe as "there were no replies adverse to democracy" (UNESCO, 1951:527). Free and fair and credible election is the conveyor of democratic consolidation as the will of the electorates is sacred and inviolable. The question here is, how has elections that is supposed to engender democratically elected political office holders to bring about development and prosperity to Nigeria, instead breeds violence, insecurity and backwardness to the people of Nigeria? We shall attempt to answer this question using the political economy theoretical frame as the basis for analysis.

2. Conceptual Clarifications

2.1 Election

Election is the legal process of selecting our political leaders for a specified term of office. From a functionalist perspective, election is seen as a formal and organised process by which individuals or groups in a state select their representatives, or leaders. It usually involves voting, where citizens cast their votes to choose from candidates or options presented. Anifowose (2003) portrays election as a process of elitist selection by the masses in any given political system. Elections are fundamental aspects of democratic systems, giving room to the citizens to influence how they are governed. Highlighting the place of elections in representative democracy Animashun (2010) argued that, Elections represents the lifeblood of modern democracy and the frequency, fairness and openness of such elections are crucial to the political stability of the polity. In this instance, Roberts and Edwards cited in Omotola (2007:21) defined elections as "a method for the selections of persons to fill certain offices through choices made by an electorate; those (citizens) who are qualified to vote under the rules and procedures of the electoral system". Elections have meaning for the functionalists only in democratic basis as it led to making a choice for decision makers by the majority of the citizens as we noted above. Elections is supposed to make the government responsible and responsive.

In the same instance, Dye (2001) refers to election as the process through which qualified adult citizens participate in the selection of candidates that will govern the state on their behalf. These definitions suggest various features such as fair participation of the electorates and candidates for elections to be accepted by the people. This participation makes the election a unique character of democratic practice and consolidation. Election enables citizens to elect their leaders ensuring the consolidation of democracy.

2.2 Electoral Violence

Electoral violence as a term has no universally accepted generalization. This can be attributed to the slogan of "violence begets violence" as espoused by Franz Fanon in the period of opposition to colonial rule. The argument here is that, defensive violence represents resisting their opponent's aggression. They portray their violence as an act of self-defence. However, International Foundation for Election Systems (2011) defines electoral violence as "any violence or (harm) or threat of violence (harm) that is aimed at any person or property involved in the

election process, or at disrupting any part of the electoral or political process during the election period”. Electoral violence presents one of the main challenges to democratic consolidation. To Fischer (2002), electoral violence is any random or organised act that seeks to determine, delay. Or otherwise influence an electoral process through threat, verbal intimidation, hate speech, disinformation, physical assault, forced “protection”, blackmail, destruction of property, or assassination. Electoral violence can be seen as a type of political violence. But it can be differentiated from political violence by its major objective. Electoral violence is committed by politicians and their supporters in order to acquire power by all means. The major patterns of electoral violence in Nigeria often consists of looting, shooting, violent interruption of campaign rallies, armed

attacks on polling and collation centers, which includes seizure of electoral materials, usually with weapons, destruction of properties owned by political opponents, hostage taking, kidnappings, abuse of power of incumbency, falsification of election results, bias involvement of security agents and electoral personnel and most especially assassination of opponents.

Nearly all of the country’s general elections have been tainted with an element of violence. This can be seen during the post-elections violence that followed the general elections of 2011 which led to the death of at least 800 people in over three days of rioting in 12 states across northern Nigeria (the worst case) in the political history of Nigeria (Human Rights Watch, 2011).

Table 2 Number of People killed and injured in the 2011 Post-Elections Violence in Northern Nigeria State

	Killed	Injured
Katsina	7	59
Kaduna	827	21
Bauchi	36	200
Adamawa	26	158
Gombe	20	147
Niger	9	27
Kano	8	22
Borno	3	10
Jigawa	1	38
Yobe	1	3

Source: Lemu Panel Report (2011)

Ironically, an estimated 20% of elections held globally experience some form of violence of which the most frequent episodes are found in South Asia and Africa (Burchard: 2015). He also indicated that, countries such as Chad, Cote d’Ivoire, Ethiopia, Kenya, Nigeria, Sierra Leone, Uganda and Zimbabwe; have all experienced a long history of elections characterised by violent protests. Extant studies have indicated that about 40% of elections or 20% of all elections conducted across Africa witnessed serious issues of electoral violence, while protracted civil clash was visible in a few other African countries such as Burundi 2015, Angola, 1992, Congo Brazzaville 1993, Zimbabwe 2008, Cote Ivoire 2010 and Nigeria 2011, and 2015 (Burchard: 2015) In the same instance George (2010) posits that, the 2019 general elections in Nigeria caused massive deaths in different parts of the country. In Rivers and Bayelsa states, 57 innocent citizens were killed due to elections violence. This is a true representation of what obtained in other parts of the country too. Høglund (2009) argued that electoral violence is the highest form of electoral fraud. To him, electoral violence is therefore a mechanism of coercive action employed by actors to advance their interest or to realise specific political objectives (2009).

Table 2: Causes of Electoral Violence

	Conditions enabling the Use of Electoral Violence	Factors Triggering Electoral Violence
Nature of Politics	Patrimonial Politics Violence as a Political Tool Culture of Impunity Access to Arms	Violent Actors Participating in Election Biased Police
Nature of Election	Competitiveness Political Mobilization Exposure to Attacks	Misuse of Political Rights Militant Mobilization “Close Races”
Electoral Institutions	System Creating Clear Winner and Losers Few Regulations about Electoral Conduct Administration with Few Checks and Little Power	Political Usage of Electoral Administration Electoral Fraud Unwanted or Unexpected Outcome of the Election

Source: Høglund, K. (2009)

2.3 Democracy

Democracy as a concept has attracted the attention of political theorists for many centuries. Suffice to argue here that, the liberal conception of democracy as opined by Scmitter and Terry is a system of governance in which rulers are held accountable for their actions in the public realm by citizens, acting indirectly through the competition and cooperation of their elected representatives (1988:76). Using the same persuasion as above, Dahl (2015), who is credited with propounding the theory of the pluralist theory of democracy explains why we should support democracy and argued that “democracy has at least ten advantages” in comparison to non-democracies:

1. Avoiding tyranny
2. Essential rights
3. General freedom
4. Self-determination
5. Moral autonomy
6. Human development
7. Protecting essential interests
8. Political equality
9. Peace-seeking
10. Prosperity.

In fact, democracy does not have to be liberal. Most countries in Africa have liberal democracies where periodic elections take place, but liberal features such as independent electoral body, judiciary and freedom of expression, are compromised thereby impacting the consolidation of democracy in those countries.

2.4 Democratic Consolidation

The term democratic consolidation refers to a political process in a country by which democracy is so variously and soundly entrenched within its institutions that it is very difficult to be compromised. To Linz and Stepan (1996), democratic consolidation connotes widespread adherence to democratic norms, robust institutions, free and fair elections, and the rule of law, which together ensure resilience against authoritarian regression and foster long-term stability. In this analysis Gorokhovskaia (2017) averred that, in simplistic terms, a country can only be said to be democratic when democracy becomes routinized, institutionalized and normalized to the extent that acting outside its tenets and practices or desecration of democratic norms is both unappealing and disadvantages for every politician and other political actor in the polity. Against generally held believe that, durability of democracies does not appear to exclude them from a degradation in the quality of their democracy. It follows therefore that democratic consolidation is not necessarily about the perseverance

of the democratic system, but rather how deep rooted are the principles, practices and processes of democracy or how well do politicians and political actors appreciate the democratic practices to allow for the consolidation of democracy in the country.

3. Theoretical Framework

Political Economy Theory provides an excellent vista for understanding the nexus between electoral violence and the consolidation of democracy in Nigeria. This theory explains how economy, power dynamics, and resource competition shape political behaviour and outcomes, including the use of violence during elections. Political Economy Theory has been advanced by several scholars such as Karl Marx (1818-1883), he laid the foundation for political economy theory. He was followed by other scholars such as Max Weber (1864-1920) who focused on how political systems, especially bureaucracies, are often influenced by economic interests and patronage. Nigerian politics is heavily influenced by patron-client systems, where resources are used to maintain political loyalty (Weber,1997). While John S. Mills (1806-1873) emphasized on how the distribution of economic resources shapes governance and social stability. His work underscores the notion that economic inequality can affect democratic processes (Mills, 1884). In his work Bates (1981) Markets and States in Tropical Africa, Bates argued correctly that elites often prioritize short-term economic gains over long-term democratic consolidation. When linked to the Nigerian environment, one can see how political elites normally use state resources for personal gain, fueling competition for political power and violence during elections

4. Dialectics on Electoral Violence and Consolidation of Democracy in Nigeria

Ironically, electoral violence in Nigeria has been a persistent feature of its political history, which is driven by a complex interplay of historical, socio-political, and economic factors. A good dialectical analysis of electoral violence in the Nigerian state requires an understanding of the inherent contradictions and issues within the country’s political processes, institutions, and of course the socio-economic structures.

Historically, the colonial state’s imposition of indirect rule over the country exacerbated ethnic and regional divisions. These divisions were further institutionalized during independence, creating a competitive and often adversarial political culture. Moreover, the years of military incursion into politics

entrenched authoritarian tendencies, engendering a winner takes-all mentality in politics. This heightened the stakes of electoral contests, making the use of violence as a tool to gain political power and to hold to it at any cost appealing to the political elites in Nigeria. Electoral violence affects the credibility of periodic elections by instilling fear and suspicion among voters, reducing voter turnout, and allowing room for manipulative practices such as ballot box snatching, vote buying, and stuffing. This has serious consequences in the consolidation of democracy in Nigeria.

While politically, the contradictions in the political realm where elite competition and patronage held sway allows the politicians to adopt the use of violence as a tool to maintain access to state resources, which are the primary means of wealth accumulation. This creates a dialectical tension between democratic norms and the survivalist strategies of the ruling elites (Human Rights Watch, 2007). The notion of winner takes all syndrome in Nigeria, allows for making elections as a “do-or-die” affair. This breeds a cycle of impunity and authoritarian tendencies, affecting the development of issue-based politics thereby undermining the consolidation of democracy in Nigeria.

Also, weak institutions such as the Independent National Electoral Commission (INEC), Nigeria Police Force (NPF) and the judiciary, are seriously undermined by corruption and political elite manipulations. INEC and the judiciary for instance have faced serious accusations of bias, inefficiency, and inability to ensure compliance to the rules, thereby underscoring public trust. This contradiction between formal institutions and informal practices naturally exposes the inability of these institutions to hold perpetrators to order. Weak institutions undermine democratic consolidation by exacerbating impunity and political elite manipulation by engaging in electoral violence which further undermine democratic consolidation in Nigeria.

Socio-economic drivers such as youth unemployment and poverty create a ready-made population of frustrated youths who are easily recruited as political thugs by the political class to disrupts the electoral process. This is a dialectical factor of the state’s failure to address socio-economic inequalities. Ethnic and religious identities are usually mobilized to incite violence, exacerbated by deeper socio-economic inequalities that were left unaddressed by the state. This invariably disenfranchised and excluded the marginalized groups, such as women and ethnic minorities, discouraging their participation in the

political process. This exclusion weakens consolidation of democracy by limiting representation and diversity in governance.

5. Conclusion

The paper concludes that, electoral violence constitutes a serious threat to the consolidation of democracy in Nigeria; as it undermines the electoral process, weakens public confidence in democratic institutions, and perpetuates a cycle of instability and mistrust. The paper also concludes that; as a result of electoral violence, lives are lost properties are destroyed, and local economies disrupted. That, the perpetuation of electoral violence in Nigeria is a cycle where structural weakness (poverty, weak institutions) interacts with political agency (manipulation by political elites). Dialectical tensions exit between forces of change (civil society, youth movements, reforms) and forces of continuity (vested interests, systematic corruption).

6. Ways Forward

The consolidation of democracy requires a multi-faceted approach in the following sectors:

Institutional Reforms: Strengthening the autonomy and capacity of the Independent Electoral Commission (INEC), judicial independence, and law enforcement to ensure free and fair elections.

Economic Empowerment: Ultimately, the process to achieve democratic consolidation in Nigeria by addressing poverty, unemployment and inequality to reduce the pool of ready-made youths usually mobilized to engage in electoral violence.

Civic Education: Raising awareness about the dangers of electoral violence and promoting peaceful participation in the electoral process. This can be achieved when seen as a collective responsibility; where the political leaders, civil society, security agencies, and the entire populace come together to reject violence and embrace the principles of democracy.

Accountability Mechanisms: By prosecuting sponsors and perpetrators of electoral violence in Nigeria to deter future occurrences will our elections be deemed free, fair and peaceful and that Nigeria can fully achieve the much-needed potential of democratic consolidation for its socio-economic development and national integration.

Technological Advancement: Introducing fully electronic voting and transmission of elections results will lead to a reduction of human interference, while fostering a political culture of inclusivity,

accountability, and respect for democratic norms and values will we enjoy democratic consolidation.

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Design and Development of a Smart, Electronic, Temperature-Controlled Food Warmer

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Abstract. This paper presents the design and development of a smart, electronic, temperature-controlled food warmer aimed at maintaining optimal food temperatures with precision and efficiency. The proposed system incorporates a Temperature sensor-based architecture to monitor and regulate the internal temperature using advanced sensors and heating elements. The system is designed with energy efficiency in mind, employing intelligent algorithms to minimize power consumption while ensuring uniform heating. Prototyping and experimental evaluations demonstrate the food warmer's capability to maintain temperatures within $\pm 2^{\circ}\text{C}$ of the desired set point, ensuring food quality and safety. This smart appliance is intended for both domestic and commercial use, offering a convenient solution for temperature-sensitive food storage and serving applications.

1. Introduction

In today's fast-paced lifestyle, maintaining food at optimal serving temperatures while preserving its quality and freshness is a challenge faced in various settings, including homes, restaurants, and food delivery systems. Traditional food warming methods often result in uneven heating, energy inefficiencies,

and degradation of nutritional value. The development of smart, electronic, temperature-controlled food warmers presents a modern solution to these challenges, leveraging advancements in sensors, microcontrollers, and user-interface technologies (Bogdanovs et al., 2019).

This paper explores the design and development of a smart food warmer that integrates temperature sensors, intelligent control algorithms, and an intuitive interface to ensure precise temperature regulation (Gao, 2023). The proposed system not only improves food safety and quality but also enhances energy efficiency and user convenience. By employing innovative design principles and incorporating feedback from end-users, this study aims to contribute to the growing field of smart kitchen technologies and pave the way for further advancements in food preservation and service (Samath et al., 2022).

2. Design Analysis

This section deals with the mathematical analysis and calculations which led to the choice of the various components used for the project.

The design process strictly follows the method outlined by the block diagram in chapter one which consist of five stages and each stage was carefully designed to ensure that it could function as a standalone device and to provide a structured way to deal with the system components, which later come together to form a whole circuit of the temperature control food warmer.

This project (temperature control food warmer) consists of the following stages which include:

- Power supply
- Battery control
- Temperature Control
- Heating element control
- Thermal system

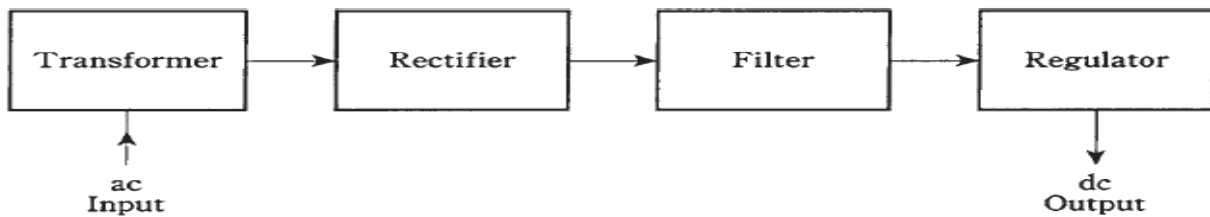


Figure 1: Block diagram of an AC to DC power supply

2.2.2 The power transformer

The transformer used here, is a step-down transformer since the output or the secondary voltage of a step-down transformer is lower than the input or primary voltage. The consideration for the size of transformer used was calculated to match the needed output voltage of the device. Since the step down transformer used is 250VA AC/ 14V DC(Liu, 2011). The peak voltage from the secondary windings is calculated as follows:

$$\text{Peak voltage} = V_{rms}\sqrt{2} \tag{1}$$

Since the $V_{rms} = 14V$

Peak voltage= $14V \times \sqrt{2} = 19.8V$ (Mbamaluikem et al., 2022).

2.2.3 Rectification

Since the two important features of a power-supply diode are the average forward current (I_o) rating and the peak inverse voltage (PIV) rating, here full wave bridge rectifier which has a maximum forward current of 1A and a maximum peak reverse voltage of 600V (1N4001) was used to make the conversion of the peak inverse voltage (i.e. 19.8V AC) into a DC voltage. And since the rectifier drawn 0.7V from the voltage in the positive and negative half cycle respectively, then 1.4 V was finally taken from the peak voltage at full wave. Therefore, the output voltage from the rectifier is then taken as:

2.1 Power Supply

The device is powered by a DC voltage which could be obtained from either the battery or from the AC power source rectified to give the DC voltage required. Here both methods were implemented in other to have alternative source of power, should in case there is power outage.

2.2.1 A.C Regulated Power Source

Most of the electronic devices and circuits require a dc source for their operation, and this was implemented by rectification with an appropriate filtering and voltage regulation. Figure 1 present the block diagram of Dc power supply.

Output voltage from the rectifier = peak inverse voltage – diode forward voltage

$$\text{Output voltage from the rectifier} = 19.8V - (1.4 \times \sqrt{2}) V = 17.8V \text{ (By \& Planning, 2015).}$$

2.2.4 The bridge rectifier

The average dc output voltage in the bridge circuit is 90 per cent of the rms ac input voltage. The PIV across the diodes is 1.4 times the rms ac input voltage

$$\begin{aligned} \text{Through rectification} &= \text{transformer voltage} - 1.4 \\ &= 14 - 1.4 = 12.6V \end{aligned}$$

By apply capacitor = $\sqrt{2} \times 12.6 = 17.8V$

Therefore, 17.8V will be regulate to 14.4V to charge the battery

Two bridge rectifiers are used in the project, one is used for battery charging circuit and the other is for heating element. It will deliver 10Amp.

2.2.5 The filter capacitor

Pulsating dc comes straight from a rectifier. The ripple in the waveform must be smoothed out, so that pure, battery is supplied. The filter does this.

Capacitor of 6800 μ F at 50V is used in the project, connected in parallel with the rectifier output. Electrolytic capacitors are almost always used. They are polarized; they must be hooked up in the right direction. it is used for the smoothening of the AC. The lower the load resistance, the faster the filter capacitors will discharge. Larger capacitances hold charge for a

longer time with a given load. The choice of the capacitor used is calculated using equation 2 (Udawat et al., 2023).

The choice of the capacitor used is calculated using the formula presented in equation (2)

$$Q = CV \tag{2}$$

$$Q = It$$

Since, $t = 1/f$

$$C = \frac{1}{V_{pp\ ripple} f_r} \tag{3}$$

Where,

C = the capacitance of a capacitor,

I = maximum output current from the transformer = $12,000 \times 10^{-3} A$

$V_{pp\ ripple}$ = maximum peak to peak ripple voltage = 1V

f_r = ripple frequency = (2f for full wave frequency = $2 \times 100 = 200 Hz$)

$$C = \frac{12,000 \times 10^{-3} A}{6,500 \mu F \times 200} = 6,500 \times 10^{-6} F = 6,500 \mu F$$

Here, 6,800µF rated capacitor is used, since 6,500µF does not exist in the market.

Filter capacitors work to keep the dc voltage at its peak level. This is easier to do with the output of a full-wave rectifier as compared with a half-wave circuit. The remaining waveform bumps are the ripple. With a half-wave rectifier, this ripple has the same frequency as the ac, or 60 Hz. With a full-wave supply, the ripple is 120 Hz. The capacitor gets recharged twice as often with a full-wave rectifier, as compared with a half-wave rectifier.

2.2.6 Switch: Switch is used in series with the fuse which control the incoming current, ON/OFF

2.2.7 Fuse: it is used to protect the circuit if there is internal fault, in event it draw high current due to over voltage or fault in the system.

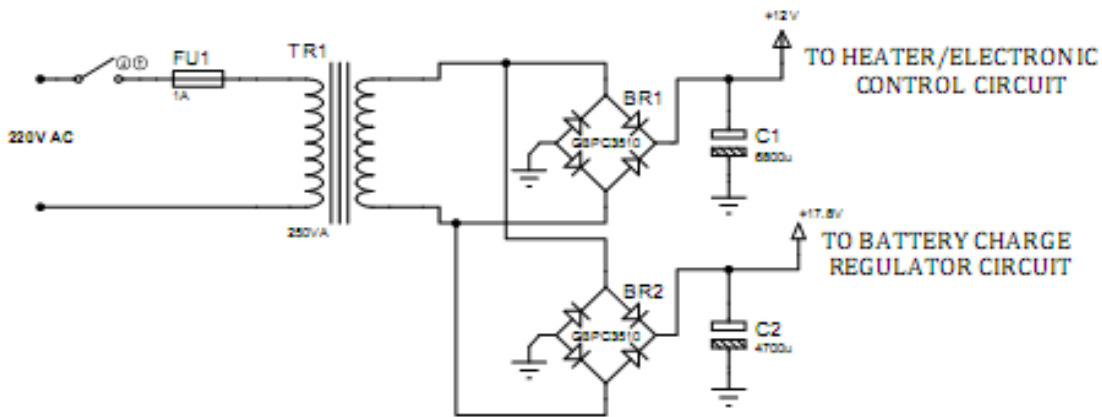


Figure 2: Power Supply Circuit

2.3 Battery Charging control

Here, 12V DC battery is used as a backup energy source for the temperature control food warmer device which passed through an appropriate voltage regulator IC LM7815 in order to regulate the battery voltage, should in case there is an overvoltage from the battery.

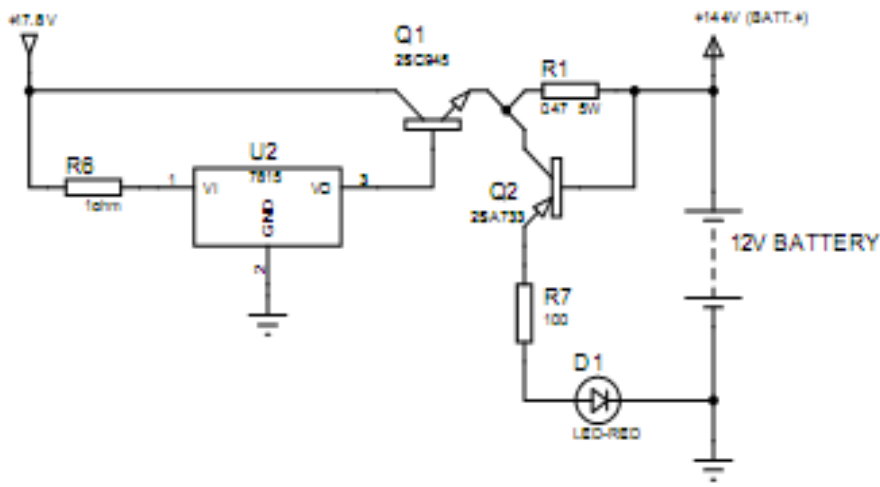


Figure 3: Charging circuit

From the circuit above used in the design of temperature control food warmer, the below components was used. Regulator: The regulator of IC LM7815 is used in the project. It is used to stabilize the voltage to 15V for the transistor (power regulator) to bring out 14.4V, and then it will charge the battery. Transistor: the transistor with the identification number 2SC5198 was used, which can handle 15A is used in the design. Resistor: resistor of 1ohm is used in the project, which is used for limiting the current from the source to the regulator(Hund, n.d.).

2.3.1 Low level battery control

Low level control is design in the project to known if the backup battery is getting low in order to avoid running down of the battery.

From the circuit above used in the design of temperature control food warmer, the below components was used.

Resistor: resistor of 2.7kΩ is used. The resistor will limit the current to the Zanier Diode.

zener Diode: 5.6V (zener voltage) which is used to break down to certain voltage. If the voltage is higher than the zener voltage. It stabilizes the voltage to certain voltage.

Diode: used to clamp down the voltage to 0.7V so that at any time current is being drawn.

Transistor: 2SC945 is used. The transistor here acts as a switch.

Biasing resistor: 100Ω is used. It biased the transistor.

Transistor: 2SC733 is used in the project to supply the relay.

Capacitor: the capacitor of 1μF is used in the project to set the given solid switch off timing or disconnection timing.

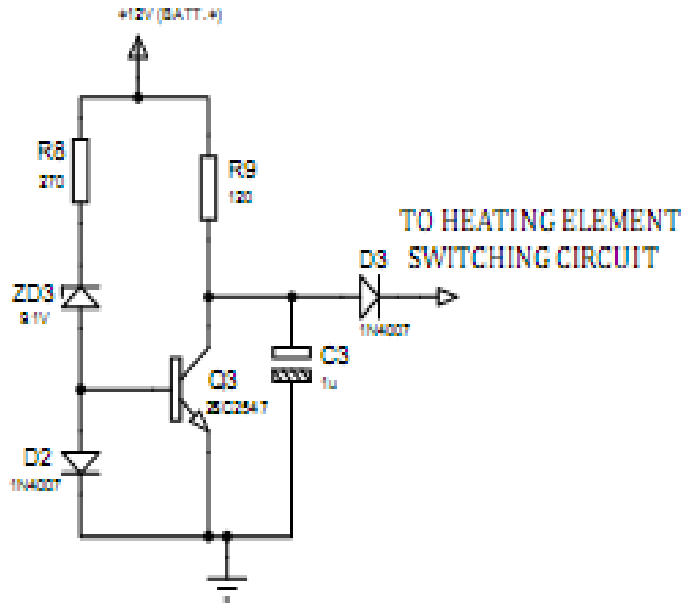


Figure 4: battery Low level control circuit

2.4 Temperature Control

Temperature is the degree of hotness of a substance or object as used in the design of this project. The higher the temperature, the shorter a heater’s service life. Thermistors are best for temperature applications with limited temperature ranges. Nichrome heater elements changes resistance less than two times in their operating temperature ranges(Nyiekaa & Francis, 2021).

2.4.1: Thermistor

In choosing the use of a thermistor, it’s important to be sure the applications are within its temperature limits. Inside their application ranges, thermistors exhibits a great change in resistance for a relatively small change in temperature.it as both positive and negative temperature coefficient but a negative temperature resistance coefficient is used in this project. Thermistor which is also called temperature sensor TTF -103. As the temperature increases, resistance decreases(Barriere, 2017).

2.4.2 Indicator

Light emitting diode is used in this project to be able to indicate when the heater is ON, and since LED can be damaged if high current is allow passing through it, so, resistor is connected in series with the LED for protection.

The LED resistance can be calculated below using ohms law

$$V = IR \tag{4}$$

$$R = V / I$$

$$V_{cc} = V_d + I_d$$

Where V_d = voltage drop across the diode which is 2.2V

I_d = LED forward current = 5mA

And supply voltage (V) = 12V

$$R = \frac{\text{supply voltage} - \text{voltage drop across the LED}}{\text{LED Forward current}} \tag{5}$$

$$R = \frac{12 - 2.2}{5 \times 10^{-3}}$$

$$R = 1960\Omega = 1.9K\Omega$$

Therefore, available market value of 1.8K Ω resistor is used for the LED indication.

2.4.3 Comparator

The comparator of LM393 is used to sense the temperature. Also use to cut OFF at desired temperature and cut IN back at lower temperature. Comparator and thermistor works together to sense the temperature ON/OFF. Comparator with the sensor may also act as the thermostat. The transistor used here to drives the relay.

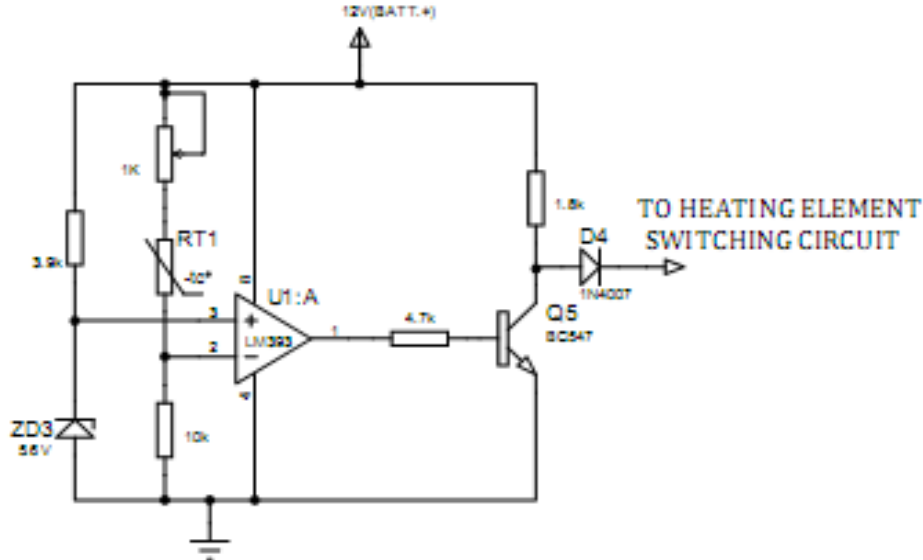


Figure 5: Temperature control circuit

2.5 Heating Element

Nichrome wire heating element is used in the project which as a tape surface (coiled element). The heating element is energy efficient and quick to heat to the desire temperature. The rated power is 100W at 12V in 8places (radial). The heating element is placed around the bowl It as upper and lower parts, which control 50W at round(Mauliddiyah, 2021).

$$\text{Current demand by the heating element, } I = \frac{100}{12} = 8.33\text{A}$$

$$\text{Current demand by each element} = \frac{8.33}{8} = 1.04\text{A}$$

The placement of heater coil is to be at equal displacement (distance radial) to each other. The eight coils are to be connected in parallel and be controlled by an electronic circuit.

2.5.1 Calculation on the linear resistance of a length of tape

To perform as a heating element the tape must resist the flow of electricity. This resistance converts the electrical energy into heat which is related to the electrical resistivity of the metal, and is defined as the resistance of a unit length of unit cross-sectional area. The linear resistance of a length of tape is calculated from its electrical resistivity as follows.

Each element coil is 32.5cm long

Tape width $b = 0.050205\text{mm}$

Tape thickness $t = 0.000525\text{mm}$

$$a = t \times (b - t) + (0.786 \times t^2)$$

$$= 0.000525 (0.050205 - 0.000525) + (0.786 \times 0.000525^2)$$

$$a = 2.63 \times 10^{-5} \text{mm}^2$$

the linear resistivity of the coil, from equation 2.2.

$$R = \frac{\rho \times l}{a} \times 0.01(\text{ohms}) \tag{6}$$

$$R = (1.11 \times 10^{-6} \Omega \cdot \text{m}) \times 32.5\text{m} \times 0.01$$

$$= \frac{2.63 \times 10^{-5} \text{mm}^2}{13.72 \Omega}$$

As a heating element, tape offers a large surface area and therefore, a greater effective heat radiation in a preferred direction making it ideal for design of temperature control food warmer.

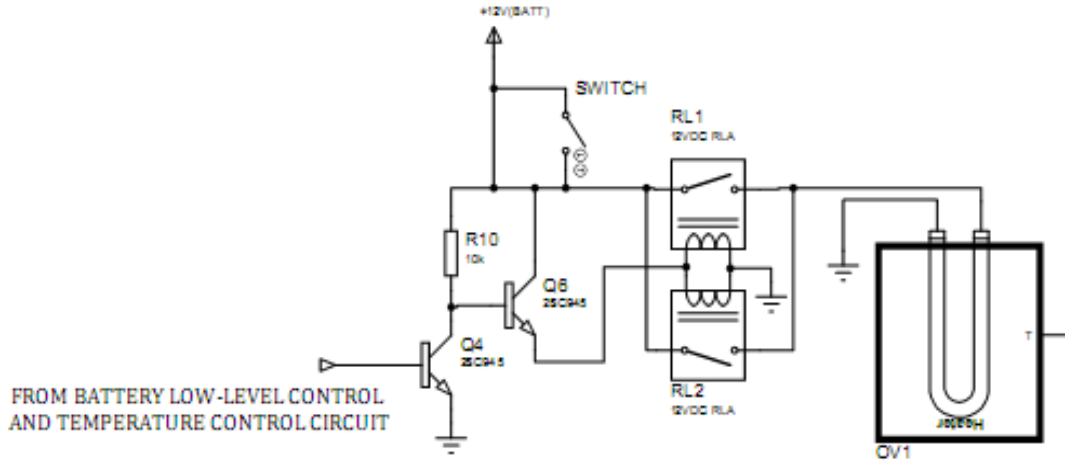


Figure 6: Heating element control circuit

2.5.2 Switch Relay

The switch here is a manual switch of 10A, Intentional switching OFF/ON the heating element. The two switches in the relay are connected in series.

The electromagnetic relay is a long-life hybrid relay that uses a mechanical relay with a triac in parallel with the contacts to turn ON and OFF the load at the zero-cross point in the sine wave. Once the triac has turned ON the load for one cycle, the mechanical relay is energized to pass the current until the turn OFF sequence when the triac again turns ON for one cycle and then turns OFF at zero cross. Relay of 10A, 12V is used, to give electric control to pass current to the heater. Also, it will switch ON/OFF the power to the heating element.

2.6 Thermal System

A thermal system is typically made up of a work load, heater, temperature controller and temperature sensor (thermistor) in the construction of this project. Figure 3.10 shows a simple food heating application using all parts of the thermal system involve in the construction of this project. The work load is the food being heated. The sensor is immersed directly into the stainless bowl so it can accurately sense food temperature. The temperature control is controlling the food temperature by adding heat as necessary. The heater, of Course, is providing the heat required to heat the food. The each part plays a vital role in the heating system(Reese et al., 2008).

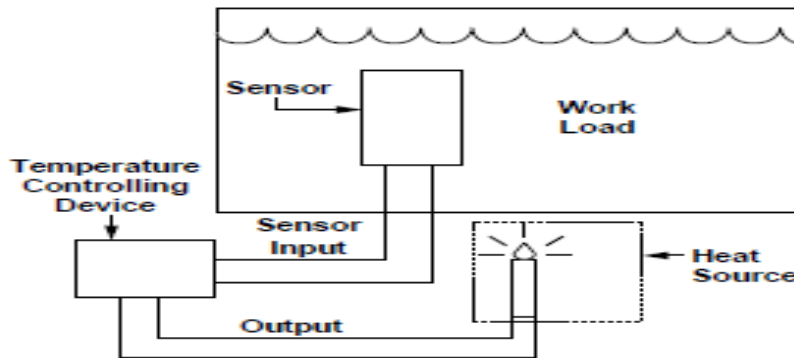


Figure 7: Thermal system parts applied-food heating

2.6.1 Thermal System Components

The main components of the thermal system used in this project include work load, heat source, heat transfer medium and temperature controlling device(s)

Work load: The work load is that which must be heated.

Heat source: The heat source is the device which delivers heat to the system.

Heat transfer medium: The heat transfer medium is the material (a solid, liquid or gas) through which the heat flows from the heat source to the work.

Temperature controlling device(s): The temperature controlling device directs its output to add, subtract, or maintain heat by switching heaters or cooling apparatus ON and OFF. The controlling system usually includes sensory feedback.

2.6.2 Thermal System Process

The sensor, controller and heater work together as a "team" to heat and control work load (food) temperature in this project. The process is as follows:

When the thermal system is switched on, the sensor senses food temperature and sends the signal to the temperature control.

The controller compares actual temperature to set point (or desired) temperature. The food temperature may below the set point, so the controller switches on the heater.

The heater raises work load temperature. The sensor is continuously feeding a signal to the controller to keep it informed of food temperature changes.

At some point, the food temperature reaches set point temperature. The controller, sensing this, switches the heater off. Now the controller will switch the heater on and off as needed to maintain set point temperature (or desire).

Then, food now serves as the heat transfer medium from heater to metal part. The cold metal part begins absorbing heat energy from the food, causing food temperature to decrease.

The sensor tells the control that food temperature is dropping. The controller compares actual and set point temperatures. It decides to switch on the heater(Mohammed et al., 2008).

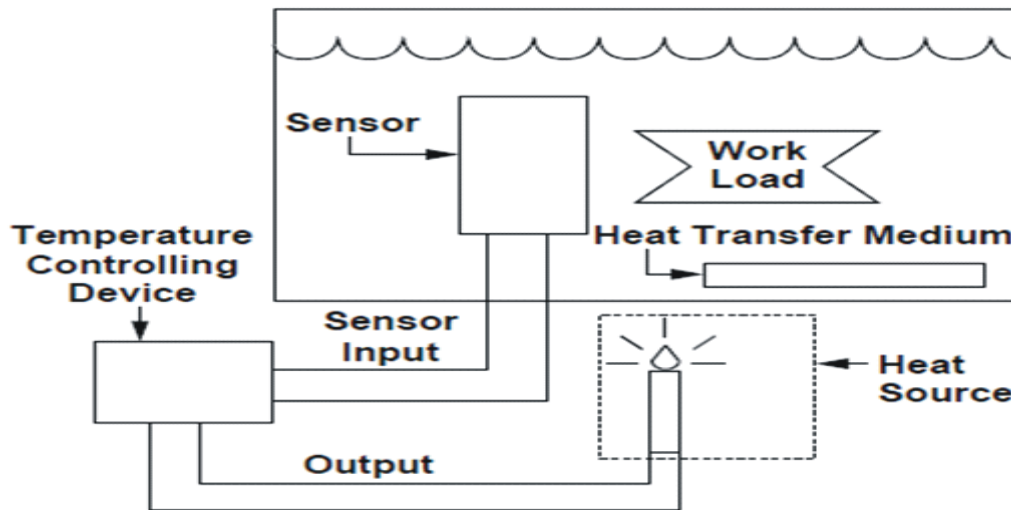


Figure 8: Thermal System Process

2.6.3 Selection of a temperature controller

The selection of a temperature controller is determined first of all by the degree of controllability required. It’s best to select the temperature controller type and model that will give the optimum control needed to achieve desired results. I’ll want to avoid selecting more control than is required.

There are a variety of control modes that provide differing degrees of controllability. The ON-OFF mode is used in the project. The operation of the ON-OFF control is just as the name implies; the output device turns full ON or it turns full OFF when reaching set point. Temperature sensitivity is designed into the control action between the ON and OFF switching points. This temperature sensitivity is established to prevent switching the output device ON and OFF within a temperature span that is too narrow. Switching repeatedly within such a narrow span will create a condition known as output “chattering” (intermittent, rapid switching). Temperature is always controlled “about set point.” This is dictated by the switching hysteresis (also sensitivity or switching differential) of the ON OFF control. The control action further dictates that there will always be a certain amount of temperature overshoot and undershoot. The degree of overshoot and undershoot will be dependent on the characteristics of the entire thermal system(Mukherjee & Sivaniranjan, 2016).

2.6.4 Thermal Control Principle

The type of thermal control principle used in the design of a temperature control food warmer is a closed loop control. The closed loop, or automatic, controller uses feedback information from the sensor to properly regulate the system. As process temperature changes, the feedback loop provides up-to-date status information that allows the controlling device to make self-correcting adjustments. The closed loop control device is a much more desirable approach to temperature control.

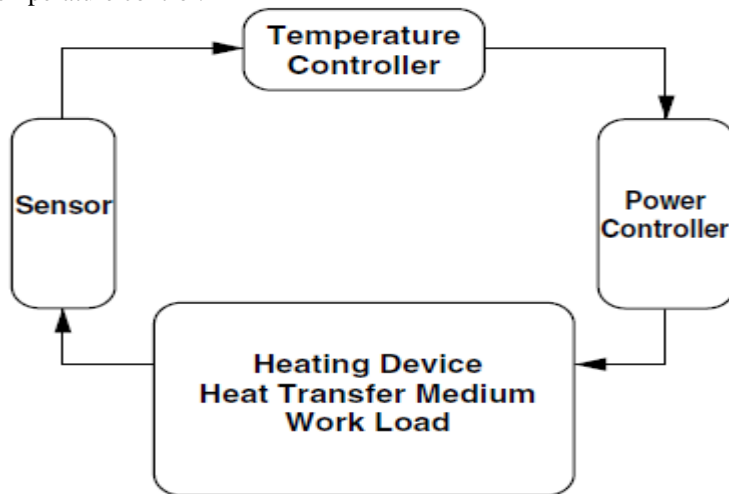


Figure 9: Closed Loop Control

2.6.5 Sensor placement

Placement of the sensor in relationship to the work load and heat source can compensate for various types of energy demands from the work load. Sensor placement limits the effects of thermal lags in the heat transfer process. The controller can only respond to the temperature changes it through feedback from the sensor location. Thus, sensor placement will influence the ability of the controller to regulate the temperature about a desired set point.

2.6.6 Sensor in a Static System

Static sensor used in the design of a temperature control food warmer. Static system occurs when there is slow thermal response from the heat source, slow thermal transfer and minimal changes in the work load. When the system is static, placing the sensor closer to the heat source will keep the heat fairly constant throughout the process. In this type of system, the distance between the heat source and the sensor is small (minimal thermal lag); therefore, the heat source

will cycle frequently, reducing the potential for overshoot and undershoot at the work load. With the sensor placed at or near the heat source, it can quickly sense temperature changes, thus maintaining tight control.

2.6.7 Energy needed to supply

$$A = U \times I \times t \quad (7)$$

Voltage, $U = 12V$

Power rating for heating element = 100W at 12V

Heating element required current, $I = \frac{100}{12} = 8.33A$

Therefore, energy needed to supplied, $A = 12 \times 8.33 \times t$

Time required, t will be varied depending on the quality of food and the type of food.

2.6.8 To determine the amount of heat required to raise the temperature

From the equation 2.7,

$$Q_n = C \times m \times (t_{\text{final}} - t) \text{ where } t < 50^\circ\text{C} \quad (8)$$

Mass m will be variable because the food content will vary

Heat capacity C will also vary from one food to another

Desired temperature t_{final} will be 50°C

Time required t will vary depending on the quality of the food and food temperature

Therefore, Heat supply, Q_n will be variable subject to food level and food temperature.

2.6.9 Principle of operation

When a heater is connected to an electric power supply, electricity flows through the resistance wire. The wire resists the flow of electric current through it. This converts electrical energy into heat energy, causing the resistance element to get very hot. After the controller receives the sensor signal, it compares the actual load temperature to the desired temperature (called set point). If the workloads (food) temperature gets too high, the heater is switched off. If the work load temperature drops too low, the heater is switched on. This “on/off” switching regulates electric current to the heater and thus work load temperature.

2.6.10 complete circuit of the temperature control food warmer

All the sections explained above such as: the power supply section, battery control section, temperature control section, the heating element section and the thermal section are put together to make up the circuit diagram of a temperature control food warmer used in the designing of the project. The diagram shown below is a full circuit diagram of a temperature control food warmer.

3.1 System Development

The heating element is attached to the aluminium plate which is insulated and placed on the stainless steel. The heat is being transmitted through the aluminium plate and stainless steel. Which is now bolted together to make sure that the aluminium plate and the stainless steel is firmly attached. The warming unit is now placed in the outer case of the temperature control food warmer which is made up of a plastic container.

First, the main assembly is the heater band which is later placed on the stainless steel. Next, the temperature sensor is placed at the bottom centre on the stainless steel.

The circuit that produces the voltage required to operate the warmer consists of a large transformer, a high voltage rectifier and a filtered capacitor. All of these components are mounted together to supply power to the temperature control food warmer.

3.2 Testing and packaging the temperature control food warmer

The power from the power supply is routed through the control section to the heating elements. Then, the warming unit began to heat up and the sensor senses the warming unit temperature and sends the signal to the controller. The controller cuts off the heater since the desired temperature has been reached. The food warmer runs for 3-4 hours continuously as part of the testing process. After testing is complete, several data points of the temperature control food warmer were taken, and the temperature control food warmer was packaged. This completes the design process.

3.3 Temperature control food warmer challenges

There were still problems to overcome before the temperature control food warmer could be used. Before we could get the mechanical materials used in this project such as the heating element, mica sheath and the insulation, these materials were selling at a high price. Thus, we developed new standards and required changes in the construction of the temperature control food warmer so as to meet up with the target. Still, we could not meet up with the market price because of those components.

3.4 Effect on food and nutrients

Several experiments have shown that if properly used, the temperature control food warmer does not change the nutrient content of foods, and there is a tendency towards greater retention of many micronutrients with temperature control food warming, probably due to the shorter preparation time.

The temperature control food warmer will only keep the food warm at 50°C. Any form of cooking will destroy some nutrients in food, but the key variables are how much water is used in the cooking, how long the food is cooked, and at what temperature.

3.5 The results from the sample experiment

Due to data taken from the experiment, the results are represented in graph style. The actual result data are available in table 4.1. There will be one graph of food temperatures against time taken to reach the desired temperature and time to maintain 50°C.

3.5.1 Experiment

Type of food - Beans
Size of food - 1.2kg
Time - 35mins

Table 4.1: Beans Replication

Temperature (°C)	Time Taken to reach 50°C, $T_{D,T}$ (min)	Recycling time, $T_{R,C}$ (min)
0	2.00	
1	2.20	
2	2.50	
3	3.90	
4	4.50	
5	5.00	
6	5.10	
7	5.50	
8	5.70	
9	6.50	
10	8.00	
11	10.50	
12	13.00	
13	15.20	
14	16.50	
15	17.00	
16	18.00	
17	19.10	
18	19.30	
19	20.00	
20	20.20	
21	22.40	
22	22.50	
23	22.70	
24	23.10	
25	29.00	
26	29.50	
27	20.00	
28	25.50	
29	26.20	
30	26.50	
31	27.00	
32	27.50	
33	28.00	
34	29.00	
35	20.00	57.00
36	20.90	55.00
37	22.00	54.10
38	22.50	54.00
39	23.20	53.30
40	25.00	52.20
41	26.30	52.00
42	28.00	50.50
43	28.90	48.00
44	30.00	47.00
45	30.10	44.50
46	32.50	40.00
47	33.40	39.00
48	34.00	38.40
49	34.90	38.00
50	35.00	36.00

Note: $T_{D,T}$ is Time Taken to reach desire temperature 50°C, $T_{R,C}$ is the Recycling time, (min)

3.5.2: Discussion

The time taken to reach the desire temperature will be vary from one food to the other depending on the quality(mass) of the food will want to keep warm.

It takes 35min before beans can reach the desire temperature and also maintain the temperature of the food for another 15min.the controller cut OFF the heater another 22min and the sensor sense the temperature level and sense the signal to the controller, later ON the heater at 35°C so as to make sure that the food is maintain at 50°C.

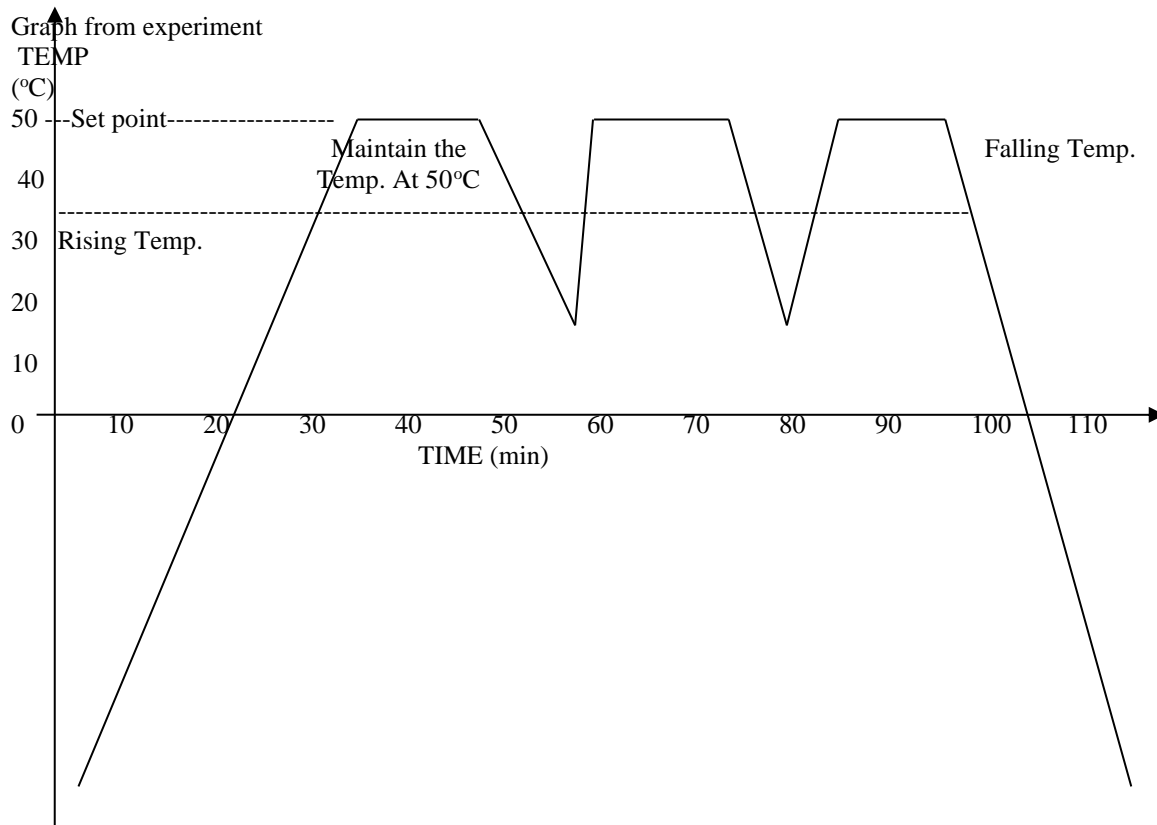


Fig.4.1 Graph of Temperature changes (°C) versus Time (min)

4. Conclusion

The design and development of a smart, electronic, temperature-controlled food warmer demonstrate the potential of integrating modern technology to enhance food storage and consumption experiences. By employing advanced temperature sensors, microcontroller-based control systems, and user-friendly interfaces, the device ensures optimal food temperature, thereby improving convenience and reducing food spoilage. The study highlights the importance of energy efficiency and user-centric design in creating practical solutions for everyday challenges. Future work may focus on improving the portability, energy source flexibility, and smart connectivity features to cater to diverse user needs and evolving technological trends. This innovation paves the way for smarter, sustainable food management solutions in domestic and commercial settings.

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Assessment of Heavy Metal Contamination of Crude Oil impacted Sites in Mangrove Ecosystem of Degema Local Government Area, Rivers State

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Abstract. The study assessed the heavy metal contents of crude oil impacted sites in selected mangrove ecosystem of Degema Local Government area, Rivers State. The study adopted the true-experimental design on twelve (12) sampling points out of which eight (8) soil samples were from the Crude Oil Exploration Sites (COES), two (2) soil samples from Artisanal Refining Site (ARS), and two (2) soil samples as the Control were randomly collected in triplicates and composited. The data collected were analyzed using Mean and Analysis of Variance (ANOVA). The study revealed that: Cadmium (Cd) concentration (2.80 mg/L) at Bukuma community was significantly higher than all other sampling points. Also, Pb, Cd, Fe, and Cu concentrations of 0.49 mg/L, 1.34 mg/L, 21.75 mg/L, and 44.64 mg/L respectively at the artisanal refining site are significantly higher than the control (0.07 mg/L), WHO (2017) limit of 3.0, 0.01, 0.003, and 0.003 for Pb, Cd, Fe, and Cu respectively in soil. Hence, the result concluded that Crude oil extraction increases the concentration of harmful heavy metals in mangroves, highlighting the need for targeted interventions to reduce pollution and human health effects. The study recommended that The Nigeria Environmental Society should collaborate with governments to monitor companies' compliance with operating standards to reduce the discharge of untreated effluents containing heavy metals that harm mangroves, biodiversity, and contaminate food and water sources as well as harm human health.

Keywords: Heavy Metal, Mangrove, Crude Oil, Ecosystem, Degema.

1. Introduction

Mangroves are dominant shrubs and trees that thrive in shallow, muddy, and tidal saline wetlands, primarily

found in seashores and creeks in subtropical and tropical coastal environments (Mangrove Action Plan, 2015; Alonge, 2016). Mangrove habitats provide numerous economic, social, medicinal, construction, and cultural benefits, along with essential ecosystem services for humans and the environment (Onugha, 2022). Mangrove plant provides significant human benefits, including food supply, fish habitat, and sediment trapping, alongside its vital ecosystem functions, especially in coastal areas (Mumby et al., 2015). The habitat provides essential benefits to communities around oilfields, supporting livelihoods. The halophytic nature of mangroves and their ability to survive low oxygen levels in coastal swamps contribute significantly to fisheries, prevent erosion, and provide barriers against storms and tidal surges (Choudhry, 2007; Smith & Sorensen, 2014). They flourish in sensitive brackish ecosystems that are vital for the local economy and support diverse flora and fauna (Ugochukwu & Ertel, 2015). Thus, the illegitimate and legitimate crude oil exploration carried out in defiance of standardized regulations, can lead to oil spills, pipeline leaks, gas flares, and untreated effluents, resulting in environmental degradation which may likely diminish and extinct the vast mangrove habitats (Sibe et al., 2019).

It is obvious fact that the continuous release of chemicals increases mangrove degradation, undermine their vital roles in carbon sequestration and mitigate ecosystem alterations in the environment (Ukwe et al., 2016). Alonge (2016) observed that the morphological and eco-physiological characteristics of mangrove plants can be distorted by contamination from oil spills, chemical effluents, etc. which affects the soil they grow in. Also, Simbi-Wellington (2020) reiterated that effluents and spills from crude oil exploration can obstruct the root openings necessary for the inhalation and growth of mangrove plants in

coastal areas, resulting in the degradation of these essential resources. Thus, the composition of effluents from oilfields contains high levels of dissolved salts, hydrocarbons, heavy metals, naturally occurring radioactive materials (NORMs), and chemicals used during oil extraction (Otevia, 2018). This could imply the Degema oilfield.

The pollution from toxic chemicals generated from oil spills and effluent discharges could adversely impact the soil, groundwater, and mangrove vegetation among other biodiversity in the environment especially in Delta region (Anyakora & Coker, 2018). This standpoint aligns with the earlier assertion by Smith and Sorensen (2014). that due to crude oil exploration activities, the mangrove forest is at present declining to less than 50 percent of its initial coverage, and over 50 percent of what is left is degraded and not adequately productive globally. Also, Nazmuz-Sakib (2021) stated that the exploration of crude oil especially in the Niger Delta states from February 1958 in Oloibiri oilfield and afterward in the Degema oilfield has affected the natural state of this coastal area that is holding between 60-80% of animals species (like monkeys, squirrels, barracuda, mudskipper, antelopes, tortoises, elephants, etc.) and the mangrove plants in Nigeria (Binuomoyo & Ogunsola, 2017). The effluents discharged during oil exploration activities as well as crude oil spillage from leaking and ruptured crude oil pipelines will increase the physicochemical characteristics in the environment (Ifelebuegu et al., 2017). Also, the impact of oil and gas exploration activities leads to the discharge of toxic heavy metals that consequentially impact the development of the natural environment as well as its inherent flora (like mangrove plants) and fauna like monkeys, squirrels, rabbits, mudskippers, antelopes, elephants in the Niger Delta region of Nigeria (Nazmuz-Sakib, 2021). The accumulation of heavy metals in fish poses serious threats to aquatic life, human health, and food chain (Hossain et al., 2019).

Heavy metals are naturally occurring elements that do not degrade but persist in the ecosystem at high density, toxic to organisms at certain concentrations (Tchounwou et al., 2012; Alloway, 2013). Common heavy metals include lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), and zinc (Zn), all of which are widespread environmental pollutants due to increasing industrialization, mining, and agricultural activities (Ali et al., 2019). Also, the activities and operations of artisanal refineries accentuate high levels of heavy metals like Copper, Chromium, and Lead concentration and contamination in the soils (Njoku et al., 2016). These activities trigger the release

of noxious metals that do not degrade but pose long-term toxicity risks to aquatic life and human health (Lee et al., 2023). In specificity, the accumulation of metals in water, soil, and organisms can disrupt biological processes and lead to detrimental environmental and health outcomes and risks for plants (like mangroves), wildlife, and humans (Hossain et al., 2019). Implicitly, the economic benefits of crude oil exploration are overshadowed by toxic effluents that severely affect fishing and farming activities near oilfields (Akakpo et al., 2018). Also, illegal discharge of untreated effluence and oil spills from crude oil exploration processes and activities result in ecological consequences like the destruction of mangrove habitats that had persisted for decades (Jiang et al., 2020). Thus, all these malfeasances are aggravated by failure for the adoption of global best practices during crude oil exploration activities in the study area. The poor regulation makes the heat and effluents generated during the distillation processes and condensation operations in artisanal refineries to seriously affect microbial loads and degrade or exterminate the biodiversity in the soil and other environmental components (Mzaga et al., 2021). The enunciated effects of oil exploration could also imply the mangroves around the Degema oilfield.

Oil exploration involve drilling, seismic surveys, refining, lubrication, and pipeline transportation activities. Conventionally, these activities must comply with laws, guidelines, and regulations to prevent oil spills, pipeline leaks, and toxic chemical discharges that can degrade the environment. The failure of both indigenous and multinational oil companies in the Niger Delta to follow global best practices in environmental compliance remains problematic. This problem has worsened the uncontrolled release of toxic effluents, wastewater, and sediments, increasing environmental pollution. Implicitly, the rising level of untreated effluent discharge, poor regulatory enforcement, and environmental pollution is a precursor to the continued degradation of the inherent ecological resources including mangroves ecosystem. Thus, the degradation of mangrove ecosystem results in the loss of their social, economic, spiritual, ecological, traditional, aesthetic, and medicinal benefits to humans and the benefiting environment. Based on this backdrop this study assessed the heavy metal contents of mangrove ecosystem in crude oil impacted sites in Degema local government, Rivers State.

2. Study Area/ Methodology

Degema Local Government Area, which is situated at the southern part of Rivers State lies along Latitude

4° 34' 27" North and Longitude 6° 56' 17" East with an Elevation of 54 metres (177 feet). As indicated, (Figures 1 and 2),

Degema Local Government Area, Rivers State is 390 sq mi (1,011 km²), out of this, land covers 347

km², water covers 538 km², while the built-up area is 126 km². The oilfields are located in swamps, tropical rainforests, and riparian wetlands, surrounded by abundant mangroves forest.

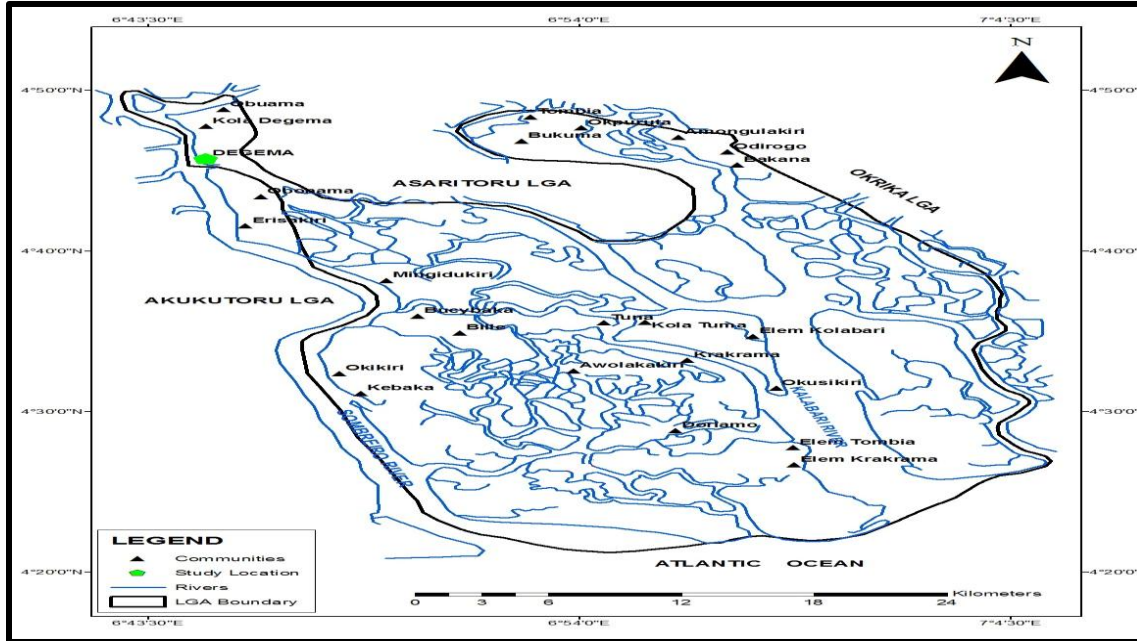


Figure 1: Degema Local Government Area showing the Communities
 Source: Rivers State Ministry of Lands and Housing, 2024.

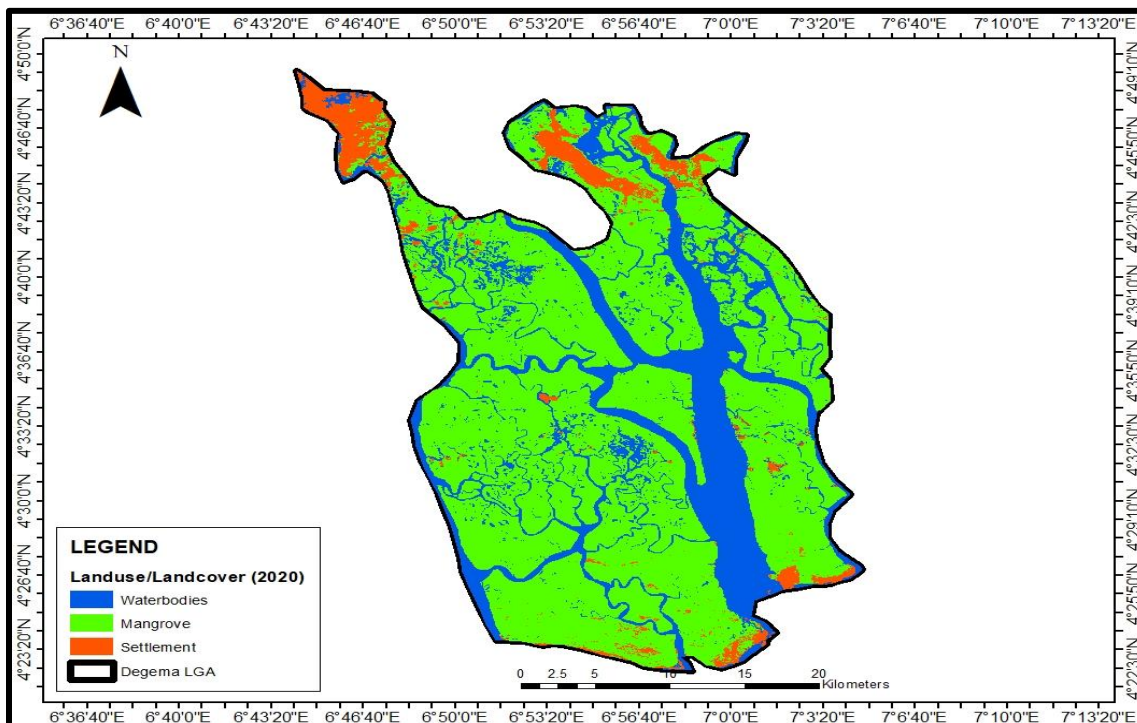


Figure 2: Landuse/Landcover of Degema showing the Mangrove
 Source: Rivers State Ministry of Lands and Housing, 2024.

The study adopted the experimental research design. Nwankwo (2016) stated that the experimental research design involved manipulating and controlling intervening variables while addressing various threats to validity, including factors related to subjects, the experimenter, experimental tools, and relevant environmental conditions.

The population of the study includes all seven (7) communities namely; Ke, Bille, Tombia, Obuama-Harry, Elem-Kalabari, Bukuma, and Bakana where crude oil exploration activities are going on and also constitutes the Degema oilfield in Degema Local Government Area of Rivers State. Sample and Sampling Technique: Twelve soil samples were collected: eight from Crude Oil Exploration Sites (COES), two from the Bille Artisanal Refining Site (BARS), and two control samples. This formed the sample frame for the study, which was conducted in four phases. First, purposive sampling was used to select five crude oil exploration locations within the Degema oilfield in Obuama-Harry, Bille, Tombia, and Bukuma communities. Secondly, random sampling was conducted to select two soil samples from within 200 and 500 meters of each purposively selected community. Thirdly, the purposive sampling technique was used in the selection of two (2) samples from the Bille artisanal refining site. In the fourth and final phase, purposive sampling was used in the selection of two (2) soil samples approximately 1500 m from the Obuama-Harry crude oil exploration site (i.e. the Control). This constituted a sample of 12 soil samples from four communities. The six instruments used for data collection in this study included an Automated Global Positioning System (GPS), measuring tape, masking tape, a field notebook, a Ziploc bag, aluminum foil, and a hand auger. The researcher, assisted by a research assistant, conducted field observations and collected soil samples at six sampling points (four COES, 1 ARS, and Control) around the Degema oilfield, using automated GPS to determine locations. The GPS was used to determine the coordinates of six sampling points in the Degema oilfield, while a hand auger was used to collect triplicate soil samples at depths of 0-15 cm (topsoil) and 15-30 cm (subsoil) from five randomly selected oil-producing communities within the study area. After determining the coordinates, the hand auger was used to randomly collect top and sub-soil samples at various points. These samples were then combined into one representative sample from both 0-15 cm (topsoil) and 15-30 cm (sub-soil) depths across six sampling points in the Degema oilfield. In addition, the collected soil samples were wrapped in a labeled aluminum foil that was later packed into sealed Ziploc bags to preserve the soil while being conveyed to the laboratory for the determination of heavy metals such as Lead (Pb), Cadmium (Cd), Chromium (Cr), Zinc (Zn), Iron (Fe), and Copper (Cu).

Laboratory Analysis of Soil Parameters: Upon arrival at the laboratory, soil samples were preserved in a refrigerator at 0 to 4 °C before analyzing selected heavy metals: Lead (Pb), Cadmium (Cd), Chromium (Cr), Zinc (Zn), Iron (Fe), and Copper (Cu). Analyses were conducted at the Department of Biology Research Laboratory, Ignatius Ajuru University of Education. The laboratory analysis began with the air or oven drying and chemically digested soil samples, followed by crushing and then sieving them to determine the heavy metals from the soil samples. Also, The soil moisture content was determined gravimetrically by drying samples in an oven at 105°C until a constant weight was achieved (Maiti, 2003; Edori & Iyama, 2017).

Data Analysis: Relevant Statistical Analytical tools like mean, charts, and graphs were utilized or deplored to answer the research questions, while Analysis of Variance (ANOVA) was used to test the hypothesis at a 0.05 level of significance.

3. Results

Table 1: Mean Concentration of Heavy Metal Contents of the Mangrove Habitat in the Crude Oil Exploration Sites in Degema Oilfield

SP	Pb (mg/1)	Cd (mg/1)	Cr (mg/1)	Zn (mg/1)	Fe (mg/1)	Cu (mg/1)
	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$
SP 1	0.07± 0.00	1.89±0.12	0.03±0.00	8.08±0.20	11.99±0.06	61.94±2.93
SP 2	0.02± 0.00	0.32±0.02	0.08±0.00	1.02±0.00	26.69±0.06	79.84±0.03
SP 3	2.69±0.05	0.00±0.00	0.88±0.00	1.26±0.00	19.79±0.09	36.86±0.10
SP 4	0.38± 0.01	2.80±0.04	0.03±0.00	1.15±0.04	23.56±0.06	86.54±0.11
Pooled $\bar{x} \pm SE$	0.79±0.02	1.25±0.05	0.26±0.00	2.88±0.06	20.51±0.07	66.30±0.79
Control	0.07±0.00	0.24±0.01	0.11±0.00	1.35±0.02	17.21±0.43	111.70±0.40

WHO (2017)	12.0-60.0	0.3-10.0	1.0-3.0	0.5-2.0	0.003	0.003
DPR (2011)	3.0	0.01	1.0	1.0	0.003	0.003

Source: Author's Computation, 2024

Legend: SP = Sampling Points, SP1 = Obuama-Harry Community, SP2 = Bille Community, SP3 = Tombia Community, and SP4 = Bukuma Community.

Figures in Table 1 presents the mean concentrations of heavy metals in the mangrove habitat of the Degema oilfield's crude oil exploration sites. The analysis reveals variations in heavy metal levels among the sampling points. Lead (Pb) concentrations ranged from 0.02 mg/L in SP 2 to 2.69 mg/L in SP 3, with an overall mean of 0.79 mg/L, which is well below the World Health Organization (WHO) guideline of 12.0-60.0 mg/L. Cadmium (Cd) levels were significantly higher in SP 4 (2.80 mg/L) compared to other sites, with a pooled mean of 1.25 mg/L, exceeding WHO's limit of 0.3-10.0 mg/L. Chromium (Cr) levels remained low, with SP 3 having the highest concentration at 0.88 mg/L, and all sites collectively averaging 0.26 mg/L, which is within the WHO guideline of 1.0-3.0 mg/L. Zinc (Zn) and Iron (Fe) levels varied, with pooled averages of 2.88 mg/L for Zn and 20.51 mg/L for Fe. These values are within safe limits according to WHO standards. Copper (Cu) was notably high at SP 4 (86.54 mg/L), with a pooled mean of 66.30 mg/L, surpassing the DPR limit of 0.003 mg/L but below WHO's general concern level. Overall, the data suggests serious environmental implications, particularly concerning cadmium and copper concentrations, which could pose risks to both marine and human life. The graphical presentation of the heavy metals contents in the soil in Table 1 was contained in Figure 3..

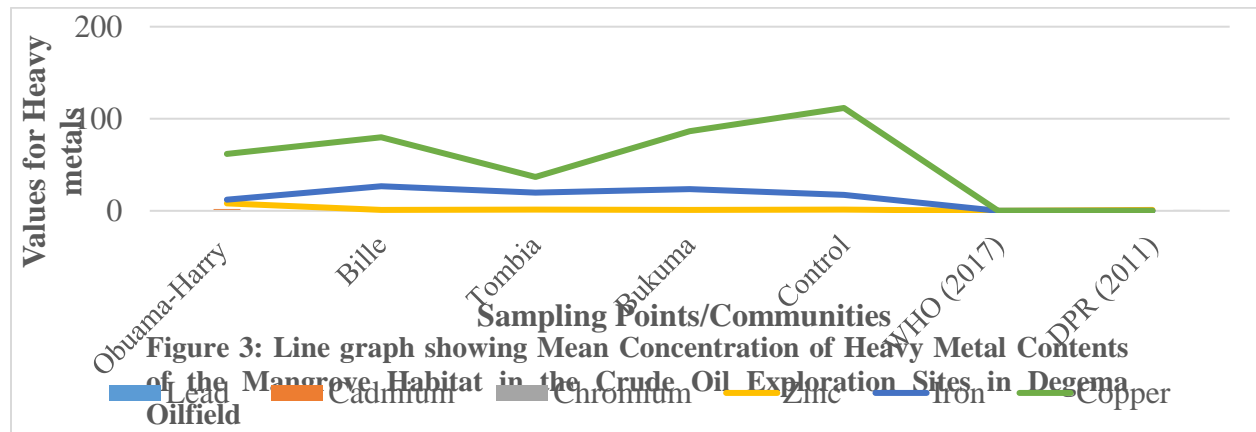


Figure 3 shows that copper (Cu) had the highest graphical values at the Control as well as other sampling points followed by iron (Fe) in all the sampling points/communities and Control. While the least graphical heavy metal property is lead (Pb) in all the sampling points in the soil in Degema Oilfield in Degema Local Government Area of Rivers State.

Table 2: Mean Concentration of Heavy Metal Contents of the Mangrove Habitat in the Artisanal Refining Site in Degema Oilfield

SP	Pb (mg/1)	Cd (mg/1)	Cr (mg/1)	Zn (mg/1)	Fe (mg/1)	Cu (mg/1)
	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$
SP 5	0.49±0.00	1.34±0.01	0.05±0.00	4.69±0.06	21.75±0.06	44.64±0.03
Control	0.07±0.00	0.24±0.01	0.11±0.00	1.35±0.02	17.21±0.43	111.70±0.40
WHO (2017)	12.0-60.0	0.3-10.0	1.0-3.0	0.5-2.0	0.003	0.003
DPR (2011)	3.0	0.01	1.0	1.0	0.003	0.003

Source: Author's Computation, 2024

Legend

SP5 = Bille Artisanal Refinery Site (Sampling Point 5) Table 2 presents the heavy metal concentrations in the mangrove habitat at the Bille Artisanal Refining Site (BARS) in Degema Oilfield. The results show elevated levels of lead (Pb) and cadmium (Cd) in SP 5 compared to the control site. Notably, Pb concentration (0.49 mg/L) in the

artisanal refining site is significantly higher than the control (0.07 mg/L), and Cd (1.34 mg/L) exceeds the WHO (2017) limit of 0.3 mg/L. Iron (Fe) and copper (Cu) concentrations are also notably higher than safe limits, with Fe at 21.75 mg/L and Cu at 44.64 mg/L. These elevated metal levels highlight significant contamination at the artisanal refining site, posing potential ecological and health risks due to bioaccumulation in local fauna and flora.

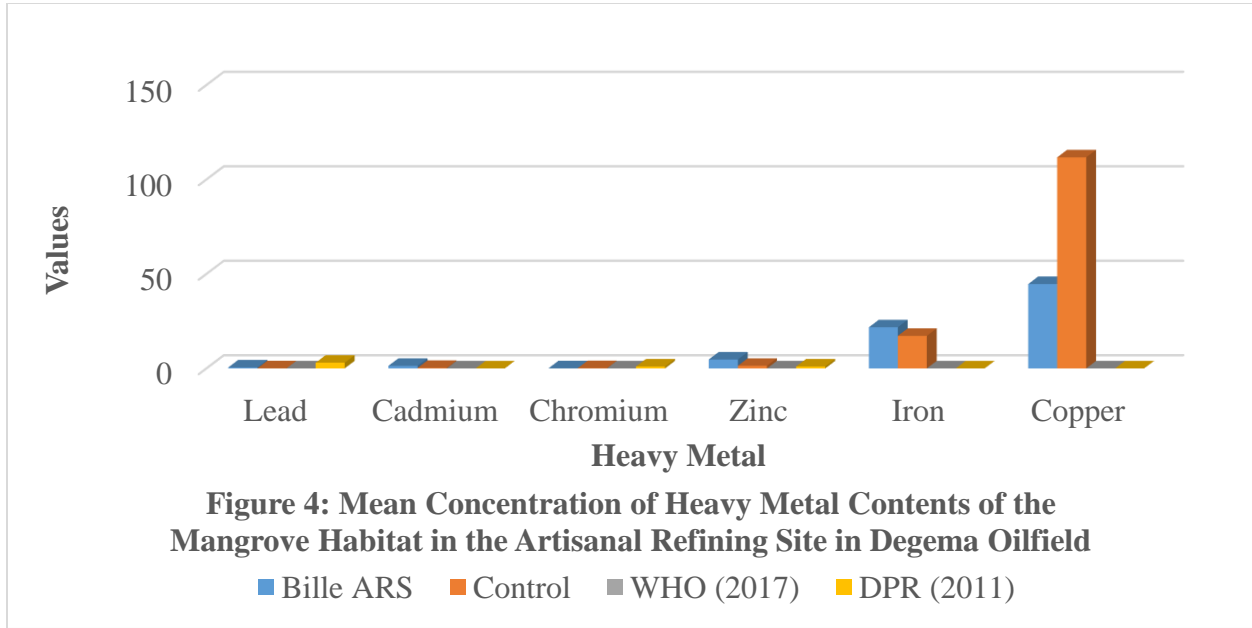


Figure 4: Mean Concentration of Heavy Metal Contents of the Mangrove Habitat in the Artisanal Refining Site in Degema Oilfield

■ Bille ARS ■ Control ■ WHO (2017) ■ DPR (2011)

H₀₁: There is no significant difference in the heavy metal contents of the mangrove habitat in the crude oil exploration sites and artisanal refining site in the Degema oilfield

Table 3: Summary of Analysis of Variance (ANOVA) on the difference in the heavy metal content of the mangrove habitat in the crude oil exploration sites and artisanal refining site in the Degema oilfield

Parameters	Lead		Cadmium		Chromium		Zinc		Iron		Copper	
	F	p-value	F	p-value	F	p-value	F	p-value	F	p-value	F	p-value
Source Variation	2346.384	0.000	484.877	0.000	45886.989	0.000	1112.250	0.000	761.974	0.000	533.159	0.000
Decision	S		S		S		S		S		S	

Decision rule: If $p < .05$ retain H_a , else reject H_a . S= significant, $p < .05$, NS= Not Significant, $p > .05$.

Table 2 shows the summary of the Analysis of Variance (ANOVA) on the difference in the heavy metal content of the mangrove habitat in the crude oil exploration sites and artisanal refining sites in the Degema oilfield in Degema Local Government Area Rivers State. It further shows that there is significant difference in the content of: Lead (F, 2346.384, $p > .05$), Cadmium (F, 484.877, $p > .05$), Chromium (F, 45886.989, $p > .05$), Zinc (F, 1112.250, $p > .05$), Iron (F, 761.974, $p > .05$), and Copper (F, 533.15, $p > .05$) of the mangrove habitat in the crude oil exploration sites and artisanal refining sites in the Degema oilfield. The null hypothesis was rejected. This indicated that the heavy metal content (such as lead, cadmium, chromium, zinc, iron, and copper) of the mangrove habitat significantly differs in the crude oil exploration sites and artisanal refining sites in the Degema oilfield in Discussion

The implications of the heavy metal concentrations presented in Table 1 are significant for environmental health and safety in the Degema oilfield. Elevated levels of cadmium and copper, particularly in Bukuma Community (SP 4) that exceed the recommended limits set by the World Health Organization (WHO) (2017), pose serious risks to marine ecosystems and could adversely affect the food chain. The presence of lead, although lower than WHO limits, remains a concern due to its cumulative effects on human health. Additionally, zinc and iron levels, while within safe ranges, highlight the need for ongoing monitoring. This finding is in agreement with Baker et al. (2021), and Ochoa et al. (2022) that prolonged exposure to high concentrations of copper (Cu) and zinc (Zn) accentuates contamination that disrupts local aquatic ecosystems affects biodiversity and food webs including various health issues, including neurological damage and kidney dysfunction.

Also, this finding is consistent with Deng et al. (2019) that the concentration of these heavy metals over time increases the pollution load of the inherent resources in an aquatic ecosystem (like the Jinjiang Estuary). This finding is consistent with the position of Onyena and Sam (2019) that heavy metals like Fe and Cu can seep into aquatic environments through human activities, especially oil exploration, leading to pollution, bioaccumulation, and adverse effects on biodiversity, humans, and the total environment. Against this backdrop, Igbani et al. (2024) suggested the integration of regular monitoring for adequate protection of the environment and its inherent resources that could be threatened by the spill, seepage, and bioaccumulation of the amount or quantity of Fe, Cu, and Pb that can affect water and fish species in an aquatic ecosystem.

The result from Table 2 reveals significant levels of heavy metals in the mangrove habitat near artisanal refining sites in Degema Oilfield, with concentrations exceeding control site levels. For instance, lead (Pb) at SP 5 is 0.49 mg/L, while cadmium (Cd) is elevated at 1.34 mg/L, both surpassing the WHO and DPR limits. This finding is in agreement with the finding by Udume and Olaiya (2021) that the heightened levels of cadmium and copper above (Cu) at 1.34 mg/L and 44.64 mg/L respectively suggest severe contamination, posing ecological and public health risks, as metals can bioaccumulate, affecting the food chain and human health. Also, the finding by Adekola et al. (2020) revealed that the elevated cadmium levels, can impair kidney function and cause other systemic health issues. The researchers align with these findings suggesting that artisanal refining activities could lead to toxic metal exposure and contamination that exacerbate environmental and human health risks likely to affect aquatic biodiversity and local communities dependent on these ecosystems.

This finding aligns with Otevia (2018) finding that the activity of crude oil exploration increases the concentration of heavy metals that in turn increase the level of toxicity and substances that eventually change the colourization and appearance of the soil and waterbodies around Bille community in Degema Local Government Area of Rivers State. This finding agrees with Udume and Olaiya (2021) observation that artisanal refining leads to the concentration of noxious heavy metals that stir pollution that impacts mangroves, crucial for coastal ecosystems and biodiversity. The researchers align with the findings as artisanal refining could heighten the colouration and degradation of the soil around the Bille community (see Plates 1-3).



Plate 1: Polluted soil with toxic **Plate 2: Polluted Waterbody with** **Plate 3: Polluted and depleted**

Substance in Bille community.
Warning on drinking, fishing and mangrove forest and habitat swimming in Bille community in Bille community.

As indicated in table 3, the heavy metal content (such as lead, cadmium, chromium, zinc, iron, and copper) of the mangrove habitat significantly differs in the

crude oil exploration sites and artisanal refining sites in the Degema oilfield in Degema Local Government Area Rivers State. This finding is consistent with the

position of Geissen et al. (2015) that the operations in artisanal refineries could heighten the concentration of heavy metals, especially iron, cadmium, and lead in the aquatic and terrestrial ecosystems. This finding aligns with the studies (Nwankwo et al., 2022; Ogbogu et al., 2023) that heavy metal pollution adversely affects soil quality and vegetation health, posing risks to both human and ecosystem health. Also, this finding agrees with (Rafique et al., 2021; Al-Juboori & Abas, 2022) that elevated levels of heavy metals like cadmium and lead can inhibit plant development and reduce agricultural productivity, while also posing health risks to humans and wildlife through the food chain.

4. Conclusion

The study concludes that crude oil exploration and artisanal refining activities heightened the plausibility of the concentration of physicochemical properties such as Lead (Pb), Cadmium (Cd), Chromium (Cr), Zinc (Zn), Iron (Fe), and Copper (Cu) at different levels around the sampled communities in Degema oilfield. Thus, the presence of these chemicals overtime predisposes humans around the source communities in the Degema oilfield to reduced breathing, cardiovascular diseases, cancer, and other health-related diseases. Conclusively, the statistical analysis reveals a clear link between crude oil extraction activities and the concentration of harmful heavy metals in mangrove habitats, underscoring the need for targeted interventions to mitigate pollution and protect these vital ecosystems as well as safeguard human health.

5. Recommendations

Based on the findings of the study, the following recommendations were proffered:

The Federal and Rivers State Ministry of Environment in conjugation with Nigeria National Petroleum Company Limited (NNPCL) should implement effective regulatory enforcement, punitive actions, and/or operational license withdrawal as urgent interventions to mitigate oil companies' discharge of untreated effluents, and deliberate environmental pollution that impedes the goal of sustainable protection of both the environment and public health.

The National Oil Spill and Detection Response Agency (NOSDRA) in conjunction with the security operatives, and communities should adopt combatant and advocacy approaches to dismantle the growing artisanal refining sites that accentuate the release of untreated effluents and spill of chemicals containing

varying levels of lead, cadmium, iron, and copper that can pollute the soil and eventually degrade the inherent mangrove habitats and plants.

The Nigeria Environmental Society should partner with the federal and state governments in designing a template for monitoring indigenous and multinational companies' conformity with standardized operational procedures that would mitigate the disposal of untreated effluents containing heavy metal pollutants that disrupt mangrove growth, stir biodiversity loss, contamination of food and water sources among other ecological consequences.

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Gender Gaps and Economic Development: The Impact of Inequality in Nigeria

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Abstract. Economic development relies heavily on human capital, yet persistent gender inequalities, where women are significantly underrepresented in education and various sectors, present a major barrier to progress, limiting both women's potential and overall economic productivity despite global efforts to address these disparities. Therefore, this study aims to assess the gender inequalities influences economic development. The study utilizes time-series data for Nigeria spanning from 1986 to 2022, employing the autoregressive distributed lag-error correction model (ARDL-ECM) methodology developed by Pesaran et al. (2001) for the analysis. The results suggest that while there is some progress in female education, existing policies aimed at improving gender parity may not be effectively translating into economic development. The study recommends prioritizing policies that ensure equal opportunities and working conditions, and eliminating gender discrimination to increase women's contributions to economic development.

Keywords: ARDL, Gender Inequality, Economic Development, Human Capital, Nigeria

1. Introduction

Economic development is a primary objective for any economy, and economic theories widely acknowledge that human capital development is crucial for achieving this goal. The swift increase in the global population, which stood at 7.6 billion in 2017 and is expected to rise to 9.8 billion by 2050, presents significant challenges for development. Among these challenges, persistent gender inequalities pose a critical barrier to global progress. Gender inequality has become deeply entrenched, limiting women's ability to exercise their democratic rights and participate in decision-making across various sectors.

Women are significantly underrepresented in activist groups, professional careers, and government roles (Fatile et al., 2012; Fodeba, 2010). In Nigeria, gender disparities are particularly pronounced. Women make up 49% of the population, yet 38% of them lack formal education, compared to 25% of men. Additionally, only 4% of women have attained higher education, compared to 7% of men. Nigeria ranks 118th out of 134 countries on the Gender Equality Index (Randriamaro, 2012).

Addressing these disparities is essential for meaningful development at local, national, and international levels. Empowering and investing in women is crucial for fostering economic progress. While some argue that Nigeria's high population growth rate is a primary obstacle to development, this perspective overlooks more significant issues such as gender inequality. Despite improvements in female labor force participation, substantial gender differences persist across economic sectors. For example, in 2017, 63.56% of employed individuals were men, while women held only 36.44% of positions. Furthermore, between 2010 and 2015, 72.3% of top civil service positions were held by men (NBS, 2018). Gender equality, particularly through empowering women, is vital for promoting economic growth. When women are not fully participating in the labour force, only half of the capable population is utilized, leading to underutilization of economic resources and a decline in productivity (Ewubare & Ogbuagu, 2017). Reducing gender inequality by increasing access to education is a key driver of women's empowerment, which in turn expands the labour force and boosts economic productivity (Anochie et al., 2015). In 2016, the literacy rate in Nigeria was 69.2% for men, compared to 49.7% for women, underscoring the urgent need for educational reforms to address gender disparities (NBS, 2018).

Despite global efforts, women are still often viewed as homemakers rather than equal partners in economic development. Development agencies have long overlooked this issue. Analyzing the 1995 Gender Development Index (GDI) and Gender Empowerment Measure (GEM) from the UNDP, Baruah (2009) noted that the Human Development Report highlighted the worsening female disadvantage in developing regions, particularly South Asia, North Africa, and Sub-Saharan Africa. Despite these findings, gender inequality remains largely unaddressed by many international experts. We are driven by several concerns, including the low government investment in female human capital development and limited access to employment for women, which have hindered their contribution to growth process. Key questions include identifying the factors perpetuating gender inequality and assessing how female human capital development through education has influenced economic growth in Nigeria.

Empirical studies on the impact of gender inequality on economic development yield mixed findings. Some studies (Egbulonu & Eleonu, 2018; Laura et al., 2018) indicates that gender inequality hinders economic development, while other studies (Bandiera & Natraj, 2013) suggest it may have a positive effect. This emerging line of inquiry, however, appears to be insufficiently explored in existing empirical surveys. The remainder of the paper is organized as follows: Section II reviews the literature, Section III outlines the empirical models and data, Section IV discusses the results, and Section V concludes with policy recommendations.

2. Literature Review

Gender refers to social, cultural, and economic characteristics associated with being male or female (UN-Habitat, 2003). It encompasses the relationships between men and women, which are constantly evolving in response to changing social, economic, political, and cultural contexts (Soetan, 2003). Gender is a social institution, cultural construct, and power dynamic that shapes individuals' activities, access to resources, and decision-making opportunities (Ikechukwu, 2013). Economic development involves transforming social systems and institutions to improve people's lives (Akanle & Adebayo, 2014). It is not solely measured by GDP growth but also encompasses social and cultural transformation (Imhonopi et al., 2013). True development requires a shift that enhances people's standard of living, self-esteem, and access to essential needs (Akanle & Adebayo, 2014). This study defines development as a positive transformation that improves women's well-

being and living standards through the collective efforts of societal actors (Imhonopi et al., 2013).

Gender disparities in socio-economic factors such as wages, income, skills, health, wealth and poverty have expanded in developing countries, largely due to women's limited access to resources, economic opportunities, and political power. In Nigeria, agriculture, dominated by men, has resulted in unequal male access to resources and information, leading to less efficient crop production compared to women (Otitoju & Arene, 2010). Both macro and micro-level studies demonstrate the effects of gender disparities on economic development, particularly through education and employment. Research indicates that gender gaps in education and employment negatively affect economic growth, while inequalities in access to managerial roles and employment opportunities further constrain economic output (Besley et al., 2004; Duflo, 2006).

Aniruddha et al. (2014) examined the influence of gender equality on economic growth using exploratory factor analysis on five indicators of gender equality. The analysis identified two main dimensions: equality in economic opportunities and equality in economic and political outcomes. Through regression analysis on an unbalanced panel of 101 countries over non-overlapping five-year periods from 1990 to 2000, they found that a one standard deviation increase in economic opportunity equality raises growth by 1.3 percentage points, while a similar improvement in participatory equality boosts growth by approximately 1.2 percentage points. However, the effect varies depending on a country's development stage: developing economies benefit more from enhanced opportunity equality, whereas developed countries see greater growth from improved equality in outcomes.

Gaywan and Adebayo (2015) explored the determinants and geographical variations of women's employment using a logistic model with geo-additive predictors. In their study, diffuse priors were employed to model fixed effects, Bayesian p-splines were used for nonlinear smooth functions, and an intrinsic conditional autoregressive prior was applied for spatial effects. The findings showed a distinct north-south divide in the likelihood of women engaging in year-round employment versus not working, while an east-west divide was evident in the prevalence of seasonal or occasional jobs. In analyzing the impact of gender inequality on economic development, Khayria and Feki (2015) examined gender inequality and economic growth across a panel of five Great Maghreb countries from 1985 to 2011, using a dynamic Generalized Method of Moments (GMM) model. Their results indicated that population growth positively influenced economic growth,

whereas gender inequality had a significant negative impact.

Olanrewaju and Okoko (2015) focused on gender inequality in agriculture, finding that high levels of gender inequality in this sector hinder economic growth in Nigeria. They recommended empowering women with necessary resources to enhance economic performance. Similarly, Adeoti and Awoyemi (2006) investigated the impact of gender inequality in employment on the productive efficiency of rural cassava farms in southwest Nigeria, concluding that increased gender inequality reduces productive efficiency. Khera (2016) used a dynamic stochastic general equilibrium model to assess the impact of gender-targeted policies on female labour force participation, formal employment, the gender wage gap, and overall economic outcomes in India. He discovered that while policies increasing female labour participation could boost output, the lack of sufficient formal job creation due to labour market rigidities leads to higher unemployment and informality, exacerbating disparities in formal employment and wages.

Ewubare and Ogbuagu (2017) analyzed the role of gender inequality in the relationship between unemployment and economic growth in Nigeria, using the Engel Granger Error Correction Model and Dynamic Stochastic Variance Decomposition Model. Their findings revealed that gender inequality is positively relationship with unemployment, while economic growth reduces unemployment. Population growth was also shown to significantly influence unemployment, underscoring gender inequality as a key factor in Nigeria's unemployment issues. Similarly, Osuizigbo (2017) explored the impact of gender inequality on economic growth in Nigeria, concluding that it negatively affects economic growth and intensifies poverty, particularly for women, due to their limited access to education and economic opportunities.

Kleven and Landais (2017) conducted a panel study across 53 countries from 1967 to 2014, examining the impact of gender inequality on economic development through factors such as fertility, education, and societal norms. Their findings highlighted that greater female labour force participation played a crucial role in reducing the gender earnings gap, emphasizing the need for changes in societal norms concerning women and children to promote gender convergence. Egbulonu and Eleonu (2018) analyzed the effects of gender inequality on economic growth in Nigeria from 1990 to 2016, aiming to develop policies that encourage women's contributions to economic growth. Their results indicated that gender inequality could

significantly impede economic performance, suggesting that closing the gender gap is vital for boosting economic growth.

To further investigate the effects of gender inequality on economic growth, Bertay et al. (2018) conducted a macro-level analysis using industry-level data and the World Bank's composite Gender Inequality Index (GII). Their study identified a negative relationship between gender gaps in education and employment and economic growth, demonstrating that gender inequality restricts the contributions of vulnerable populations to economic development. This gap could lead to a reduction in potential output, productivity, and declines in per capita income and consumption, which negatively affect savings, investment, and capital formation. Similarly, Laura et al. (2018) conducted a macro-level study across 127 low- and high-income countries to explore the impact of gender factors on economic growth. Their findings underscored the importance of achieving gender equality, suggesting that it promotes economic growth by improving access to education, finance, and economic opportunities. The study also emphasized that increased female participation in politics fosters economic growth and advances development.

Adekunle et al. (2020) unraveled the underlying structural relationship between macroeconomic policies and gender equality in SSA from 1993 through 2017 using panel data on the indices of macroeconomic policies and gender inequality in all 48 SSA countries. The study employed the dynamic panel system generalised method of moments estimation procedure (dynamic system GMM) to establish a baseline level relationship between the variables of interest and adjusted for heterogeneity assumptions inherent in ordinary panel estimation and found a basis for the strict orthogonal relationship among the variables. The results suggest that previously attained level of gender equality influences prevailing gender equality. Also, exchange rate and inflation exhibit an inverse relationship with the attainment of gender equality and government expenditure is positively and linearly related to the attainment of gender equality in Sub-Sahara Africa.

Meanwhile Olubiyi et al. (2022) explored the extent to which Sustainable Development Goal (SDG) 5, which promotes gender equality, is influencing small and medium-sized enterprises (SMEs) in Kenya and Nigeria. The research focused on female entrepreneurs, with a sample of 110 randomly selected businesses from Embakasi East constituency in Nairobi County, Kenya, and Ikeja Local Government in Lagos Mainland, Nigeria. Using a qualitative

research approach, the study conducted open-ended interviews. Descriptive statistical analysis revealed that many women working in SMEs in both countries were unaware of the SDGs, despite efforts by the United Nations to promote gender equality. The study concludes that there remains a significant gender gap in SMEs across Africa, and awareness of SDG goals among women in these enterprises is still low.

Ngulube et al. (2024) evaluated the effectiveness of gender equality policies implemented in Zambia over the past decade and their impact on the country's economic growth. The total target population was 1200. The sample size involved a total of 120 respondents; both men and women, which was 10% of the target population. A mixed method approach was used in this study in combination with the descriptive survey design. Interviews and surveys were used to collect data. Graphs and pie-charts were used to analyze the quantitative and qualitative data obtained. The study findings indicated that while Zambia has made strides in improving gender equality, significant disparities remain, particularly in areas such as education, employment, and political participation. Women in Zambia continue to face barriers to accessing quality education and formal employment, which in turn hampers their economic empowerment and contribution to economic growth. Additionally, cultural norms and legal constraints often limit women's opportunities and reinforce gender inequities.

3. Research Methodology

The model utilizes the econometric approach from Risikat (2012), which extends the Solow growth model by incorporating real GDP as a function of the investment-to-GDP ratio, human capital accumulation (disaggregated by gender), labour force, trade openness, and government spending on community services. This study introduces a novel aspect by adapting the model to use GDP per capita as the dependent variable. The generalised autoregressive distributed lag (ARDL) $((p, q, [\dots], q))$ the equation model is stated as:

$$\begin{aligned}
 \text{In}gdppc_t = \varphi_o + \sum_{i=1}^n \rho_i \text{In}gdppc_{t-i} + \sum_{i=1}^n \theta_i Z_{t-i} \\
 + v_t
 \end{aligned}$$

(1)

Here, *In*gdppc represents the natural logarithm of gross domestic product per capita. The terms φ is the constant, while ρ is the parameter. θ represents vector of observed time-variant control variables and their

associated regression coefficients. The dependent and explanatory variables may be purely $I(0)$ or $I(1)$, or cointegrated. The terms p and q denote the optimal lag orders, while v_t is the error term, which are unobservable zero-mean white noise processes, assumed to be serially uncorrelated or independent.

Before applying the error correction mechanism, it is essential to first establish the presence of cointegrating relationships among the variables. This is accomplished using the ARDL bounds test approach, as outlined by Pesaran et al. (2001). The test primarily utilizes the joint F-statistic, which has a non-standard asymptotic distribution under the null hypothesis of no cointegration compared to the alternative hypothesis of a cointegrating relationship. The bounds test accommodates the inclusion of both $I(0)$ and $I(1)$ variables in the model, resulting in two critical value levels. The decision criteria are based on three possible outcomes.

The decision criteria for the ARDL bounds test are as follows:

If the calculated F-statistic exceeds the upper bound critical value for $I(1)$, it indicates the presence of cointegration, suggesting a long-run relationship among the variables.

If the F-statistic falls below the lower bound critical value for $I(0)$, it suggests that there is no cointegration, meaning no long-run relationship exists among the variables.

If the F-statistic falls between the lower bound for $I(0)$ and the upper bound for $I(1)$, the results are inconclusive.

Once cointegrating relationships are identified, the long- and short-run dynamics are analyzed using log-log error correction representations, specified as follows:

$$\begin{aligned}
 \Delta \ln gdppc_t = & \alpha_o + \gamma(\beta_1 gdppc_{t-i} - \beta_2 pop_{t-i} \\
 & - \beta_3 sef_{t-i} - \beta_4 sem_{t-i} \\
 & - \beta_5 lfpf_{t-i} - \beta_6 lfpm_{t-i} \\
 & - \beta_7 gpi_{t-i}) \\
 & + \alpha_{1i} \sum_{i=1}^n \Delta gdppc_{t-i} \\
 & + \alpha_{2i} \sum_{i=1}^n \Delta \log pop_{t-i} \\
 & + \alpha_{3i} \sum_{i=1}^n \Delta sef_{t-i} \\
 & + \alpha_{4i} \sum_{i=1}^n \Delta sem_{t-i} \\
 & + \alpha_{5i} \sum_{i=1}^n \Delta lfpf_{t-i} \\
 & + \alpha_{6i} \sum_{i=1}^n \Delta lfpm_{t-i} \\
 & + \alpha_{7i} \sum_{i=1}^n \Delta gpi_{t-i} + \varepsilon_t
 \end{aligned}
 \tag{2}$$

In this context, Δ denotes the difference operator, and γ represents the speed of adjustment coefficient and expected to be negative. The expression within parentheses () denotes the error correction term, ECT, which is the residual from the long-run equation. The coefficients β_i are the long-run coefficients, while α_i are the short-run dynamic coefficients that describe the model's adjustment towards long-run equilibrium. Due to the non-stationarity characteristics of most time series variables, examining their properties is crucial

to avoid spurious empirical results. Therefore, this study commenced its econometric analysis by conducting stationarity tests using the Augmented Dickey-Fuller (ADF) test to examine the time series properties of the variables. The ADF unit root test was employed to determine the long-run convergence of each series to its true mean. The ARDL approach, advanced by Pesaran et al. (2001), was adopted for estimating the long-run relationship, which involves two steps: examining the existence of a long-run relationship and estimating long-run and short-run coefficients. This approach allows for a mixture of stationary and non-stationary variables and does not require the same order of integration for variables under consideration, making it a suitable technique for this study.

3.1 Data Sources

This section describes the variables, their measurements, and the data sources used in the study. The variables cover the period from 1986 to 2022 and are sourced from the World Development Indicators (2022) by the World Bank. The empirical model incorporates a total of seven variables. The variables include *gdppc* is gross domestic product per capita, *pop* is population, *sef* is school enrolment secondary female (% gross), *sem* is school enrolment secondary male (% gross), *lfpf* represents labour force participation rate, female (% ages 15 and older), *lfpm* denotes labour force participation rate, male (% ages 15 and older) and *gpi* is gender parity index. Table 1 provides a detailed overview of these variables, including their apriori expectations, measurements, data sources.

Table 1: Variables' measurements, a priori expectations and sources

S/N	Variables and Measurements	Economic development (<i>gdppc</i>)	Sources
1.	Population (<i>pop</i>)	positive	WDI, 2022
2.	School enrolment secondary, female (% of gross) (<i>sef</i>)	positive	WDI, 2022
3.	School enrolment secondary, male (% of gross) (<i>sem</i>)	positive	WDI, 2022
4.	Labour force participation rate, female (% ages 15 and older) (<i>lfpf</i>)	positive	WDI, 2022
5.	labour force participation rate, male (% ages 15 and older) (<i>lfpm</i>)	positive	WDI, 2022
6.	Gender parity index (<i>gpi</i>)	Positive/ negative	WDI, 2022

Note: WDI - World Development Indicators

Source: Authors' compilations, 2024

4. Discussion

Table 2: Summary Statistics and Correlation Matrix

Variables	Mean	SD	<i>lgdppc</i>	<i>gpi</i>	<i>lfpf</i>	<i>lfpm</i>	<i>lpop</i>	<i>sef</i>	<i>sem</i>
<i>lgdppc</i>	5.966	1.150	1.000	0.688	0.763	-0.575	0.726	0.738	0.699
<i>gpi</i>	0.764	0.130		1.000	0.564	-0.530	0.568	0.552	0.561
<i>lfpf</i>	45.518	3.156			1.000	-0.680	0.677	0.517	0.693
<i>lfpm</i>	66.659	4.722				1.000	-0.728	-0.730	-0.723
<i>lpop</i>	18.685	0.234					1.000	0.703	0.664

<i>sef</i>	25.516	7.394	1.000	0.695
<i>sem</i>	34.068	5.915		1.000

Notes: SD: standard deviation; *gdppc*: gross domestic product per capita; *pop*: population; *sef*: school enrolment secondary female; *sem*: school enrolment secondary male; *lfpf*: labour force participation rate (female); *lfpm*: labour force participation rate (male); *gpi*: gender parity index

Source: Authors' compilations, 2024

The results of the summary statistics and correlation analysis are presented in Table 2. The findings indicate that the *sef* and *sem* highlight disparities in access to education, which could have long-term impacts on economic development and gender equality. The correlation matrix shows no evidence of multicollinearity among the variables.

Stationarity test

Prior to estimating the model, stationarity test is conducted using the Augmented Dickey Fuller (ADF) method to ensure that none of the variables are integrated of order two, *i*(2) series. The results presented in

Table 3 indicate that the variables in this study are a mix of *i*(0) and *i*(1) series, making the bounds test the suitable cointegration method to apply.

Table 3: Augmented Dickey Fuller (ADF) Test

Variables	ADF Statistic at Level	Critical Value 5%	ADF Statistic Difference	1 st Critical Value (5%)	Order of Integration
<i>lrgdppc</i>	-2.264	-3.568	-4.391	-3.572	<i>i</i> (1)
<i>gpi</i>	-5.052	-3.568		-3.572	<i>i</i> (0)
<i>lfpf</i>	-0.670	-3.568	-3.986	-3.572	<i>i</i> (1)
<i>lfpm</i>	-1.397	-3.568	-3.978	-3.572	<i>i</i> (1)
<i>lpop</i>	1.168	-3.568	-3.875	-3.572	<i>i</i> (1)
<i>sef</i>	-3.152	-3.568	-6.184	-3.572	<i>i</i> (1)
<i>sem</i>	-3.756	-3.568		-3.572	<i>i</i> (0)

Source: Authors' compilations, 2024

Cointegration tests results

Table 4: Result of the Bounds Test

Test Statistic	Value	K
F-statistic	4.49	6
Critical Value Bounds		
Significance	<i>i</i> (0) Bound	<i>i</i> (1) Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: Authors' compilations, 2024

The results of the bounds cointegration test, presented in Table 4, show F-statistics of 4.49, which provide strong evidence against the null hypothesis of no cointegration. This rejection at the 1% significance level indicates the presence of cointegrating relationship among the variables in the model. These findings suggest that the regressors act as the forcing variables, leading the response when a common stochastic shock occurs in the system. The implication is that b gross domestic product per capita adjusts in response to changes in these indicators.

Table 5: Long run and short run estimates

Variable	Coefficient
<i>Long-run estimates</i>	
gender parity	-30.8785 ^b (-2.47)
labour force participation rate, female	0.8975 ^a (4.16)
labour force participation rate, male	0.3604 ^a (3.92)

population	-2.6915 (-1.03)
school enrolment secondary, female	1.0428 ^b (2.74)
school enrolment secondary, male	-0.8563 ^b (-2.51)
Constant	17.0931 (0.39)
<i>Short-run estimates</i>	
Δ gross domestic product per capita_1	0.5109 ^b (2.79)
Δ gross domestic product per capita	2.0264 (1.31)
Δ gender parity_1	57.0793 ^a (4.35)
Δ labour force participation rate (female)	0.2765 (0.50)
Δ labour force participation rate (female)_1	-0.4545(-0.98)
Δ labour force participation rate (male)	0.5307 ^b (3.31)
Δ population	11.1855 (1.95)
Δ school enrolment secondary female	-0.3719 (-0.79)
Δ school enrolment secondary female_1	0.0279 (1.90)
Δ school enrolment secondary male	0.0823 ^a (3.58)
Δ school enrolment secondary male_1	1.6015 ^a (4.43)
ECT_1	-0.4723 ^b (-6.87)
<i>Diagnostic</i>	
Jarque-Bera (normality)	0.5139
Breusch-Godfrey (serial correlation)	2.753
ARCH LM (cond. heteroscedasticity)	1.377
CUSUMSQ (stability)	Stable
Notes: ^a , ^b , ^c indicates 1%, 5% and 10% levels respectively; numbers in parentheses are t-statistics based on white heteroscedasticity-consistent standard errors; Δ is the difference operator; ARCH-LM: autoregressive conditional heteroscedasticitylagrange multiplier; CUSUMSQ: cumulative sum of squared residual	

Source: Authors' compilations, 2024

Table 5 presents the results for the model where convergence to long-run equilibrium is at a speed of 47% with the adjustment term negative and statistically significant at the 1% level. In the long-run, a percentage point increase in the gender parity index is associated with a reduction in the volume of bank credit by -30.879. This suggests that increase in gender parity index by 1% point contributes about 30.879% decrease in gross domestic product per capita, on average, *ceteris paribus*. This relationship is statistically significant at the 5% level and inconsistent with *apriori* expectations. Also, both labour force participation rate (female) and labour force participation rate (male) are positive predictors of gross domestic product per capita at the 1% significance level respectively which are in line with *apriori* expectations while school enrolment secondary, male negatively impacts gross domestic product per capita at the 5% significance level which contradicts the *apriori* expectations. The impact of school enrolment secondary, female on gross domestic product per capita is statistically significant at 5% level. The diagnostic results provide evidence that the models are stable with normally distributed residuals, and the model specifications do not suffer from autocorrelation, autoregressive conditional heteroscedasticity. Hence, the findings from this study can be used for inferences.

5. Conclusion

Gender gaps, encompassing disparities in rights, opportunities, working conditions, and discrimination against women, continues to pose significant barriers to the contributions of women to economic development in Nigeria. Despite the increasing number of educated women, persistent gender gaps remain substantial obstacles to progress. These gaps undermine women's productivity in an economy striving to enhance its overall economic performance. However, the results reveal that that existing policies aimed at improving gender parity may not be translating effectively into economic development which has a negative relationship. Although, the positive impact of female secondary school enrollment on economic development, contrasted with the negative impact of male enrolment, indicates a need to align education with labour market demands. This study recommends that policies should be prioritize on ensuring that there are equal opportunities, equal working conditions and the stoppage of all forms of gender discrimination and bias in order to increase women's capacity and efforts towards economic development which might involve addressing structural barriers that limit the economic contributions of women despite progress in gender parity.

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Part Two
Social Psychology



Perceptual Effect of Stereotypes in MTN Fastlink and Dettol Advertisements on Image of Female University Workers in Nigeria

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Abstract. This study investigated the perceptual effect of the advertisers' strategies using stereotypical images of women to attract attention of consumers to their advertised products and services on the image of women in the work place using MTN (Fastlink) and Dettol Antiseptic advertisements as cases. The study specifically examined the extent of the gender portrayal in the selected advertisements; ascertained the audience interpretations of the gender stereotypes in the selected advertisements; and the perceptual effects of the stereotyped advertisements on female University workers in Ogun State. Survey method was adopted while questionnaire was used as instrument for data collection. A proportionate sample of 286 was drawn from staff members of three Universities in Ogun State while the convenience sampling technique was adopted for the administration of copies of questionnaire. Findings revealed that the selected advertisements portrayed women in an inferior context and showed that the advertisements capable of impacting negatively on the image of women in the workplace. Other findings showed female workers disagreeing to stereotypes in the selected advertisement affecting their personality while the audience generally perceived highly that female stereotypes can hamper managerial opportunities and positions for women. Hence, the study recommends that women should see themselves as talented individuals with unique skills, who can manage their affairs in the world with dignity and decorum. Females that feature in advertisements should reject roles that debase and dehumanize women folk. Advertisers should start representing women in the society positively and advocate for equity and women liberation in Nigerian society through advertisements.

Keywords: Stereotypes, Gender, Advertisements, Audience, Perception, MTN Fastlink, Dettol Antiseptic

1. Introduction

The media acts as a conduit for important elements of the advertising sector. The media is crucial in making people rely on them and in influencing people's views and opinions. Slater (2012) said that one of the primary elements of media has been advertising. Advertising uses emotions to appeal to consumers and sell a variety of goods, in order to maximize profits, advertising are particularly prone to utilizing stereotypes to sell items. Advertising is a message that uses a commercial to sell goods, but it can also be used to sell someone, in this example a gender. Advertising that contains stereotypes serves to legitimize gender inequity in society. Stereotyping, according to McLeod (2017), is an overly generalized belief about a certain perception, person, gender, or race of individuals. It is a generalization about people based on an oversimplified premise and exaggerations. Advertising stereotypes are preconceived notions about characteristics of men and women as they are presented in the media. Women are portrayed as running errands for males, cooking, doing household duties, and doing laundry and submissive while men are perceived as the boss. Numerous studies have shown that stereotypes about women in the media, such as the idea that they are weak, illogical, unintelligent, and submissive to men, are perpetuated (Dimitrios, 2006; Koenig & Eagly, 2014; Anvitha, 2021). These portrayals are consistently displayed in commercial messages and played out at different managerial levels.

According to Goffman's (1979) research of visual representations of men and women in commercials, gender roles are replicated in the relative positions and facial expressions of men and women in the advertisements. Such visuals may seem natural, but they actually show stereotypes, the strength of ideology, and its capacity to subconsciously influence audience members' beliefs. Such clichéd portrayals have an impact on how individuals think, act, and feel. Members in the audience frequently have diverse interpretations of these commercials. Advertising has influenced society as well as how performers are portrayed in the media. Studies have demonstrated that stereotypical representations of women have led to unfavorable emotions (Anvitha, 2021). In Goffman's (1979) research of almost 400 print advertisements, it was found that depictions of women in commercials undermine them. According to Block, Koch, Liberman, Merriweather, and Robersons (2011), the negative media impact of gender stereotypes is also permeating the workplace by reinforcing traditional views of women's roles and skills. This leads to gender bias in the workplace and society at large. More literary works have highlighted societal preconceptions and prejudices against women who aspire to positions of authority, according to Catalyst (2016). There are still a lot more advertisements that could lead to the negative effects of gender roles on female counterparts in society, despite the increased tendency for more and more women to pursue higher education, develop career aspirations, and be able to perform well in the workforce with aspirations for higher and executive positions previously held by their male counterparts. The purpose of this study is to better explore the roles stereotypes play in advertising and how they affect how people see women in the workplace and in society at large. Result of this study will help to enlighten the media actors: the advertiser, advertising agencies and the public to give reason to why stereotypical image of women should be curbed. It will be of important value to women in Nigeria realizing their worth and value and also be ready to exercise equal right with their male counterpart. This research will also help advertising agencies to be very careful with the dissemination of information regarding the portrayals of female actors in advertisements in Nigeria.

This study focused on female stereotypes caused by advertisement and intends to provide answers to the questions of: (i) In what way have female been

portrayed in Dettol and MTN Fastlink advertisements? (ii) What is audience perception and interpretation of gender role in Dettol antiseptic and MTN Fastlink adverts? (iii) How is female stereotype in the Dettol antiseptic and MTN fast link reinforcing the gender bias for women in their work place and in the Nigerian society?

1.1 Statement of the Problem

With the rising advocate for gender equity and recognition for a better society and national development, the roles of women in the society are adjusting and increasingly improving, as today, the occupation of both men and women has advanced giving opportunities for both men and women working at the same organization earning similar salaries. Even though women are now holding better positions of responsibility in the modern society, it is still worrisome to learn that the portrayal of women in the media and in advertisements in particular has not changed. It still depicts the attributes of women in the traditional era. As a result, the society still holds strongly on their stereotypical perception of a female gender and by extension to the work place. Peoples' emphasizes on the portrayals of women in adverts limit their chances of holding higher positions despite the fact that these features or portrayals are already going obsolete. This stereotype equally affects women's perception of their roles and their abilities to assume leadership positions. It is against this backdrop that this study seeks to assist in ascertaining whether advertisements in Nigeria play amplifying functions for female stereotypes and how stereotypes in advertising affects the image of women in their work places in Nigeria using MTN (Fastlink) and Dettol antiseptic advertisements as case study.

1.2 Research Questions

- What is the extent of the gender stereotypes in the MTN (Fastlink) and Dettol antiseptic advertisements?
- What are the audience interpretations of the gender stereotypes in MTN (Fastlink) and Dettol antiseptic advertisements?
- What is the perceptual effect of the audience interpretation of stereotyped MTN (Fastlink) and Dettol antiseptic advertisements on female workers in the three Universities?

1.3 Dettol Antiseptic Advertisement

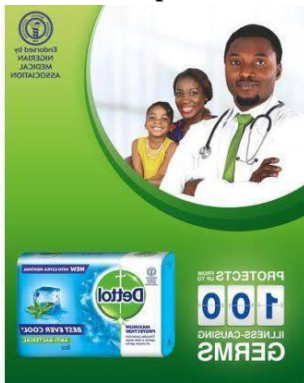


Figure 1



Figure 2



Figure 3

The above image of Dettol antiseptic shows a male medical practitioner shown on the foreground, posing with masculine confidence, hands crossed and focused on the camera with a woman and a girl shown at the background, smiling at the camera (figure 1). In Figure 2 is an indication of a woman performing the role of home keeper? While in figure 3, a nursing mother is playing with her daughter while the daughter was washing her hands.

1.4 MTN Fastlink Advertisement

From the observation of a popular TV advertisement, MTN Fastlink modem, a young female Personal Assistant in the office was seen receiving a call from her 'male' boss to get some documents he had asked for the previous day because he was almost at the office and needed them urgently. The lady hurriedly brought out her MTN Fastlink and downloaded the files before the 'male' boss got to the office. In this advertisement you see a supposed typical male – always in control, issuing commands to the subordinate female – and a supposed typical female – always docile, submissive, eager and ready to please the 'male' boss.

2. Gender Stereotyping in Advertising

Gender stereotypes are defined as an oversimplified idea or image about a particular group of individuals that is disseminated and used to identify members of that group (McLeod, 2017). Gender stereotypes, according to social role theory, are a result of the unequal distribution of men and women in terms of social roles at work and at home (Koenig & Eagly, 2014). Women are perceived as being more communal than males, being responsive to others, and forming relationships, whereas men are perceived as being more agentic than women, taking charge and being in control. Women have traditionally handled the

majority of household chores and served as the primary caregivers. Women have a tendency to work in service-oriented, people-oriented jobs rather than male-dominated, competitive, thing-oriented jobs in the workplace (Lippa, Preston, & Penner, 2014). Gender stereotypes are created as a result of the unequal distribution of men and women in social positions and the conclusions that may be drawn about the characteristics of each gender as a result (Koenig & Eagly, 2014).

Our society is significantly impacted by male and female gender stereotypes. Society displays fewer attitudes that favor discrimination and inequality between men and women as a result of the recent advancements made to achieve sex equality. But despite the fact that our views and attitudes have been liberated, many of our behaviors are still shaped by gender stereotypes and false notions about men and women that have been passed down through the generations. Unexpectedly many people today relate to one another based on a gender stereotype, despite their declared principles. Every gender stereotype distorts how people view the distinctions between men and women. These timeworn attitudes overstate the qualities that distinguish men and women, and place the two sexes in artificial categories.

The media and advertising have also had an impact on gender roles. Despite the fact that the media did not invent stereotyping, it has a significant impact on its creation and maintenance (Cooke-Jackson & Hansen, 2008). Everyday, stereotypical pictures are presented in the media, and these portrayals may breed prejudice against out-groups, causing individuals to feel unfavorably about themselves and their fellow members (McShane & Von Glinow, 2014). Stereotyping can be traced back to childhood, tradition, or job experiences in addition to the media. Men have traditionally been seen as the breadwinners,

career-driven, aggressive, and independent types, while women have been portrayed as low-level employees, devoted wives and mothers, in charge of taking care of children and doing housework.

3. Impact of Gender stereotypes on the Image of Female workers in Nigeria

Today's family structure is more based on collaboration than on patriarchal, and women have greater opportunities and rights in the workplace. The transformation in this circumstance was significantly influenced by the feminist environment. The women's liberation movement campaigned to redefine traditional gender norms and advance women's rights. Although gender inequalities are still there, they are not as extreme as they once were. It appears that the media has an impact on how men and women vary from one another and how gender stereotypes of men and women are exaggerated to promote items. Women are shown as emotionally receptive and communicative, yet infantile, helpless, and incompetent, while men are portrayed as dominating, powerful, paternalistic, and uncommunicative. In fact, a number of aspects of women, including their sexuality, family obligations, proactive responsibility, breastfeeding, and child-care responsibilities, are cited as justifications for control and exclusion from crucial roles in business organizations. In a 2005 Catalyst study, participants assessed women less favorably than males with equivalent skills, particularly in professions where men predominate. Another significant study found that the biggest obstacles to the promotion of female managers in Europe, across regions and nations, are prejudices and preconceived notions about women's responsibilities and talents (Cordano Scherer & Owen, 2002). According to many research (Tomkiewicz, Frankel, Adeyemi-Bello, & Sagan, 2004; Schein, 2007), gender-based prejudices have an impact on how often and quickly men are promoted compared to women who are similarly qualified. Therefore, in accordance with the gender-role stereotyping perspective (Powell, Butterfield & Parent (2002), women have been socialized to adopt attitudes and behaviors that are incompatible with the requirements of a successful managerial career. Since management is considered to be a "male" occupation, it calls for aggression that is goal-oriented and emotional fortitude, both of which are often associated with men. On the other hand, the stereotype persists: women simply do not possess the personality attributes that are typically associated with managers. In general, males as a social group are taught the skills and abilities necessary for pursuing a managerial profession (Murphy, 2016). This type of stereotypical

attitude is likely to cause employees and managers to consider women as ineffective managers in job roles at odds with the more traditionally passive gender role for women (Powell et al., 2002; Schein, 2007). Traditional gender stereotypic notions hinder women from advancing in their careers as well as from pursuing specific professions. Such stereotypical ideas, according to Peterson and Gravette (2000), not only hinder women's progression and progress in the workplace but also affect how their managers and peers view their work and recommend them for skill-building programs. According to Olojede (2004), gender role stereotypes teach women in Nigeria to be less competitive than their male counterparts. This idea is deeply ingrained in Nigeria since the country is a very patriarchal society where men and women's social interactions and activities are guided by cultural norms that prioritize men's interests above women's (Olowe, 2007).

As a result, when women first enter the workforce, they find it difficult to advance and must deal with deeply ingrained unfavorable gender stereotypes. Men are more frequently considered for managerial roles since it is stereotyped that they are more capable than women (Ogbogu, 2010). The widespread misconceptions regarding the abilities of men and women have not altered much over the years, despite several improvements (Okafor, 2011).

4. Theoretical Review

This study is anchored on the Framing and Liberal Feminism Theories. Erving Goffman (1922) developed the Framing theory in 1974. Goffman established the frame concept in which he described that the frame represents structure and is used to hold together an individual's context of what they are experiencing in their lives, represented by a picture. The framing theory is employed for efficient communication in all areas of the media and other organizations, and it is mostly used to comprehend the effects of the media. The way an issue is framed affects how people are exposed to it and how they interpret it. Frames form distinct layers of reality, claimed D'Angelo & Kuypers, 2010). There are numerous benefits that framing carries, including:

- An issue can be emphasizing on certain event.
- Framing can regulate the audience's perception and the acceptance of a particular meaning or message.
- Negative framing can create a large impact on the people since media plays an important role in the audience's understanding.

Also, framing can entail some weaknesses which include:

- Bias media can negatively frame an issue and can influence a large group of people.
- Intuition and careful interpretation of the audience are inevitable when it comes to framing.

The media is a powerful tool so the context must be framed with values as it influences and controls the audience.

In relation to this study, it shows that the ways and manners advertisers portray the objects they associate with their advertisement in order to pass product messages with the intention of persuading consumers to buy such products can positively or negatively impact on the image of such objects. In most of the advertisements made in recent times, framing is instrumental in depicting the obsolete characteristics of women in the society.

Theoretically, liberal feminism, which Alison Jaggar created in 1983, focuses more on topics like equality in the workplace, in education, and in political rights. The main objective of liberal feminism is to achieve gender equality in the public domain, including better working conditions, equal access to education, and wage equity. It is a specific strategy for attaining gender equality that places an emphasis on each individual's capacity to change negative stereotypes about women. The goal of liberal feminism is for people to use their own skills and the democratic process to advance gender equality in the workplace, society, and the law. Liberal feminists use the resources and methods at their disposal to promote change through uniting women into larger groups that can speak with more authority, lobbying lawmakers, and bringing concerns to the public's attention. The theory contends that women have the right to be given equal opportunities and consideration alongside their male counterpart wherever they find themselves because the study examines how women's representation in advertisements can affect the public perception and image of them and can stand in the way of their chances of achieving their goals.

5. Research Methodology

A quantitative survey method of research was employed for the study with the use of questionnaire as the instrument for data collection. The population of the study consisted of male and female teaching and non-teaching staff of Olabisi Onabanjo University

(OOU), Tai Solarin University of Education (TASUED) and Federal University of Agriculture, Abeokuta (FUNAAB) in Ogun State. A sample size of 50 female and 50 male staff members were proportionally selected from each University to constitute a sample size of 300. This decision was made to allow for possible equal representation of gender within those who have risen up the ladder and are occupying positions of higher responsibilities. This choice also helped to further elicit their interpretations and beliefs on the portrayals of women in the two selected advertisements and how they relate to their work place. The description of Dettol and MTN Fastlink advertisements were done to refresh the memory of the selected respondents on the commercials while their agreement was also solicited for the downloading of the selected advert images and videos for them to take time to watch before the completion of copies of the questionnaire. A convenience sampling technique was used for the administration of copies of questionnaire to the sample size. A convenience sampling is a type of non-probability sampling method where sample is taken from a group of people that are easy to contact or reach. The result generated from the questionnaires distributed to the respondents was analyzed using descriptive statistics.

6. Results

Out of the 300 copies of questionnaire distributed to the respondents, 286 were returned given a valid (95%) percentage useful for the data analysis.

Table 1: Gender of Respondents

Variables	Frequency	Percentage
Gender		
Male	154	54%
Female	132	46%
Total	286	100.0%
Marital Status		
Single	39	14%
Married	240	84%
Separated	07	2%
Work Experience		
5-years – 10 years	121	42%
10years and above	165	58%
Total	286%	100%

The table showed 154 (54%) respondents as male and 132 (46%) respondents as female. 39 (14%) of the respondents were single while 240 (84%) were married. 121 (42%) respondents had a work experience of 5-10 years while 165 (58%) had been working for more than 10 years

Table2: Extent of Gender portrayal in the Dettol and MTN Fastlink advertisements viewed by the University staff in the Television and the Newspaper

Variables	High Extent	Some Extent	Low Extent
Dettol Advertisement			
Women portrayed as housewives	118(41%)	45(16%)	123(43%)
Women portrayed as house cleaners	126(44%)	139(49%)	21(7%)
Women portrayed as Care-giver	143(50%)	82(29%)	61(21%)
Women portrayed as home builder	64(22%)	151(53%)	71(25%)
Men portrayed as breadwinners	176(62%)	67(23%)	43(15%)
Men portrayed as professional and accomplished career persons	210(73%)	19(7%)	57(20%)
MTN Fastlink Advertisement			
Men portrayed as superiors and order-givers	124(43%)	86(30%)	76(27%)
Women portrayed as subordinates and order- takers	131(46%)	91(32%)	64(22%)
Men as intellectuals and career driven	115(40%)	99(35%)	72(25%)

In the table, 43% of the respondents agreed to low extent that women are portrayed as housewives in the Dettol advertisement. 49% of the respondents agreed to some extent that women are portrayed as house cleaners, 50% of the respondents agreed to high extent that women are portrayed as care-giver. 53% agreed to some extent that women are portrayed as home builders. 62% of the respondents agreed to a high extent that men are portrayed as breadwinners. 73% of the respondents agreed to a high extent that men are portrayed as professionals and accomplished career persons. While in the MTN Fastlink, 43% of the respondents agreed to a high extent that men are portrayed as superiors and order-givers. 46% of the respondent agreed to a high extent that women are portrayed as subordinates and order-takers while 40% of the respondents agreed to a high extent that men are portrayed as intellectuals and career driven.

Table 3: University staff Interpretation of the role played by women in the MTN Fastlink and Dettol Advertisements

Interpretations	Strongly Agree	Agree	Strongly Disagree	Disagree
Women are expected to be in the background always	56(20%)	75(26%)	102(36%)	53(18%)
Women are not ambitious enough to be successful in the business world.	62(22%)	98(34%)	116(41%)	10(3%)
Women cannot be aggressive as business situations demand	129(45%)	25(9%)	57(20%)	75(26%)
Women are not competitive enough to be successful in the business world	96(34%)	77(27%)	65(23%)	48(16%)
Women’s place in the work place can at best be as subordinates to men	91(32%)	62(22%)	89(31%)	44(15%)
Women are better as emotional support and care givers	133(46%)	21(7%)	75(26%)	57(20%)
.Women are completely submissive even in the work place	156(55%)	23(8%)	39(14%)	68(24%)
women’s role in society is much appreciated as housewives, house cleaners, care-givers, and home-builders	179(63%)	17(6%)	34(11%)	56(20%)

In the audience interpretation of Dettol and MTN fast link advertisements, audience interpreted (54%) that women are expected to be in the background always; it was interpreted (56%) that women are not ambitious enough to be successful in the business world; it was interpreted (54%) that women cannot be aggressive as business situations demand; it was interpreted (54%) that women’s place in the work place can at best be as subordinates to men; it was interpreted (53%) that women are better as emotional support and care-givers; it was interpreted ((63%) that women are completely submissive even in the work place; and also interpreted (69%) that women’s role is much appreciated as housewives, house cleaners, care-givers, and home builders.

Table 4: Perceptual effect of the interpretations of female stereotypes in Dettol and MTN Fastlink advertisements on the image of female University workers

Perceptions	Very Extent	High Extent	High Extent	Moderate Extent	Low Extent	No Extent
Do the adverts make you perceive that women’s best position in the work place can only be as subordinates to men	77(27%)		19(7%)	87(30%)	53(19%)	50(17%)
Do the adverts make you perceive women as less competent and intelligent to compete with men for higher positions of responsibility in the work place	17(6%)		59(21%)	113(40%)	23(8%)	74(25%)
Do the advert make you perceive that women in higher authorities may not receive adequate supports from men subordinates in the work place	81(28%)		15(5%)	77(27%)	98(34%)	15(6%)
Do you perceive that female stereotypes in the adverts can slow down their confidence and progress in the work place	33(12%)		32(11%)	73(26%)	62(22%)	84(29%)
Would female stereotypic perceptions hamper managerial opportunities and positions for women	102(36%)		15(5%)	76(27%)	28(10%)	65(22%)

Does stereotypic belief spread in selected adverts affect your perception about female abilities in the work place	47(16%)	12(4%)	82(29%)	66(23%)	79(28%)
Do you perceive that the portrayals of female gender in advertisements may have negative effect on them in the workplace	18(6%)	28(10%)	138(48%)	23(8%)	79(28%)
Would stereotypes affect your personality in the work place	12(4%)	34(12%)	78(27%)	29(10%)	133(47%)

In the above table, the audience perceived to a moderate extents(49%) that women’s best position in the work place can only be as subordinates to men; audience perceived (48%) to a moderate extent that women as less competent and intelligent to compete with men for higher positions of responsibility in the work place; audience perceived (61%) to a moderate extent that women in higher authorities may not receive adequate supports from men subordinates in the work place; audience perceived (48%) to a moderate extent that female stereotypes in the adverts can slow down their confidence and progress in the work place; audience highly perceived (41%) that female stereotypes can hamper managerial opportunities and positions for women; audience believed (52%) that the stereotypes spread in selected adverts can affect their perception about female abilities in the work place; audience perceive that the portrayals of female gender in advertisements may have moderate (56%) effect on them in the workplace while the female workers perceive stereotypes may not affect (47%) their personality in the work place.

7. Result and Discussion

The finding above revealed that in the Dettol and MTN advertisements, to a high extent men are portrayed as breadwinners, professionals and accomplished career persons. Men are also portrayed as superiors, order-givers, intellectuals and career driven. While to a high extent, the respondent agreed that women are portrayed as subordinates and order-takers, the respondents agreed to some extent that women are portrayed as house cleaners and home builders and the respondents agreed to low extent that women are portrayed as housewives in the Dettol advertisement. The outcome of the study is in agreement with (Hoeritz, 2013; Anvitha (2021) who described attributes for female gender such as women cooking, doing home chores, washing laundries, portray such as women being the ones running errands for the men, being submissive while the men are seen as a boss. Findings from the study revealed that the media messages about women are stereotyped in manners such as women are irrational, fragile, not intelligent, submissive and subservient to men (Wingfield, 2020).

With more than 50 percentage agreement, another finding established the interpretations of stereotypes of female in the MTN Fastlink and Dettol antiseptic advertisements to be that women are expected to be in

the background always; women are not ambitious enough to be successful in the business world; that women cannot be aggressive as business situations demand; that women’s place in the work place can at best be as subordinates to men; that women are completely submissive even in the work place; and that women’s role is much appreciated as housewives, house cleaners, care-givers, and home builders. This findings also established previous studies that employees and managers holding this type of stereotypic view are likely to perceive women as ineffective managers in job positions incongruent with females’ more traditionally passive gender role (Powell, Butterfield, and Parent, 2002; Schein, 2007). Traditional gender stereotypic ideologies not only prevent women from entering certain professions, but also prevent them from moving upwards. According to Peterson and Gravette (2000), such stereotypic ideologies are not only detrimental to women’s advancement and progress in their workplace but also influence how their contemporaries and managers perceive their work and nominate them for skill acquisition programmes in the workplace.

Moreso, audience perceived the effect of the interpretations of role played by women in the MTN Fastlink and Dettol antiseptic that women’s best position in the work place can only be as subordinates to men; that women could be perceived as less competent and intelligent to compete with men for higher positions of responsibility in the work place; audience also perceived moderately that women in higher authorities may not receive adequate supports from men subordinates in the work place; audience perceived to a moderate extent that female stereotypes in the adverts can slow down their confidence and progress in the work place; audience believed moderately that the stereotypes spread in selected adverts can affect their perception about female abilities in the work place; while the female workers themselves did not perceive themselves lowly and that the stereotypes will not affect their personality in the work place. The latter finding was in variance with Schein (1973) and Terborg, Peters, Ilgen, and Smith (1977) who asserted that according to the gender-role stereotyping perspective, women have been socialized to adopt attitudes and behaviour that are in conflict with the demands of a successful managerial career.

8. Conclusion and Recommendations

Having properly and carefully reviewed relevant literature and study the responses of the respondents, some logical conclusion can be made here. It is very safe to logically conclude that portrayals of women in adverts need to be properly addressed. The responses evaluated pointed out that the media needs some redress so that they can positively impact the image of women in the society. Considering that they want to make their products more attractive in adverts so that the audience can get to the reach of majority of the audience. The portrayal does not have to be overly negative but at least can be brought to its minimal so it can speak positivity to the societies at large. Hence this study recommends that advertising agencies need to reduce exaggeration in their advertisements to the minimal. Some specific roles that women portray in advertisement could also be ascribed to men because men also do these, so by reducing the roles portrayed on women and portray them by men will produce a better portrayal in their content and reduce negative stereotypical portrayal. Also, advertising agencies have to be advanced and up to date in their advertisements, female have taken spots in managerial level, as bosses, presidents, managers and also executives.

Advertisement agencies also have to start including these portrayals more often on women and not only men. Women too should step up confidence level. They should see themselves as talented individuals with unique skills, who can manage their affairs in the world with dignity and decorum. Females that feature in advertisements should reject roles that debase and dehumanize women folk.

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Abortion in Okpokwu and its Socio-Religious and Moral Implications

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Abstract. This research, examined abortion in Okpokwu, a Local Government Area in Benue State, Nigeria and its socio-religious and moral implications. It considered the reasons why young adults opt for abortion when unwanted pregnancy occurs among them in the community, despite the prevailing religious and moral givens. Procuring abortions comes with dire consequences, including stigma and the loss of human lives of both the fetus and the mother. Researchers have established that individuals' religious, social and moral position influence one's attitude and general outlook on live issues including abortion. Using both quantitative and qualitative methods, the work asserted that, abortion is not just a medical issue; it also has ethical, religious and social dimensions. This work found out that various contextual and structural factors could shape the abortion decision by women who conceived before marriage. This includes the influence of globalization and social media. The study further identified that socio-religious and structural constraints made no much impact in discouraging abortion; rather, people continue to procure abortion due to wrong advise, shame, fear, peer pressure and the availability of abortion drugs in patent medicine shops. The work advised that religious, political and traditional leaders in Okpokwu, should rise to the occasion to nipping in the bud, this menace of abortion, which has claimed myriads of young and adolescent lives in the community.

Keywords: Abortion, Religion, Morality, Okpokwu

1. Introduction

Women, all over the world, have experienced unwanted pregnancy at one time or the other. When this happens some of these women usually, seek to terminate the pregnancy by safe medical means, while others, due to ignorance engage in harmful means of

pregnancy termination. The termination of pregnancies most generally known as 'abortion,' is a universal phenomenon occurring throughout all levels of societal organization within recorded history. Techniques implemented are highly varied as are circumstance under which it is practiced. Abortion has been described by various views, especially, the religious groups, as a vice affecting every nook and cranny of the society (Jeje, 2021).

The Center for Human Development, Ile-Ife in conjunction with UNICEF (2000), declared that over 50% woman in Nigeria are pregnant by the age of 20. This number may be higher in some quarters. Out of this number, only 21-28% give birth, between the age of 15 and 17, and 40% are mothers by the age of 18. There are various reasons for abortion among young adults. Some of which are: poverty, illiteracy, incompetence, fear of the societal or religious stigmatization and so many others.

Abortion and problems relating to pregnancy are leading causes of death in women of child bearing age, with complications from abortion consistently increasing by the day. Studies have shown that in every 100,000 abortions in Africa, 680 die (UNPE, 2000). Many African laws, including Nigeria, make abortion a criminal act to perform or seek for, except it is for the purpose of saving the woman indulging in the act and the people demanding for it. Abortion is still secretly practiced by medical practitioners and is still on the high side especially among young adults.

Religion, generally conceived, is one of the agents of social integration and personality formation. It has the capacity to modifying ideas, feelings and conditioning actions. The Nigerian society especially, the people Okpokwu Local Government are a religious people in every of their outlooks. Collaborating this stance, Oduyoye, (2021, pp. 4-6), affirmed that, "Africa

“culture” is imbued with religion and religion is used to under-gird and validate culture. Religion also, has affinity with morality as it is difficult to divorce religion from morality in Africa.

Abortion in Africa has both social, religious and moral implications. While agreeing with this, sociologists, however, have further discovered that other factors, such as age grades and parental upbringing have more influence on pregnant teens, when it comes to abortion matters, than religion (Cooper, 2014). This work concerns itself with discussing these issues on abortion matter in Okpokwu, in essence. In what follows, the researchers, shall examine some key concepts that formed the nexus of the work.

1.1 Statement of the Problem

Churches and religious bodies are rapidly springing up everywhere in Okpokwu Local Government Area; unfortunately, there is an outrageous rise in cases of abortion in the communities that make up the Local Government. Thus, confirming the fact that religious activities and moral education emanating from the Churches, have not adequately addressed the dangers of abortion on reproductive health and the entire society generally. The religious attempt to reduce and control sexual activities in the society was not wholly effective, as the approach to the control and discourage premarital sex was only carried out through suspension. Some religious norms regard sex education and discussion as morally unhealthy. Spirituality and sexuality have been separated, and thus, encouraging sex education, is seen as a means of increasing the knowledge of sex among the members of Christian community. Labeling sexuality talk ‘a taboo’, by most religious folks, the adolescents took advantage of this to explore the social media for sex education and information. Hence, many have fallen prey of some unhealthy contents regarding the subject matter, resulting in the constant rise on abortion procurement by the young people in Okpokwu. These problems fueled the motivation for this research.

1.2 Objectives of the Study

The objectives of this research are to:

- Examine the socio-religious and moral implications of abortion in Okpokwu Local Government Area
- Investigate which of the institution’s weakness that pave way to a continual abortion incident in Okpokwu Local Government Area

- Understand the reasons why young girls opt for abortion when unwanted pregnancies occur
- Proffer possible recommendations that would prevent abortion related vices affecting the future of adolescents in Okpokwu Local Government Area

1.3 Research Questions

The following research questions have been framed to elicit reasons and factors responsible for the rising cases of abortion in Okpokwu Local Government Area:

- How do young adults have access to means for abortion as is the case in Okpokwu Local Government Area?
- How were they educated on the possibilities of abortion either safe or unsafe means?
- Who do you think is to be held responsible for making abortion decisions?
- Is abortion morally acceptable by the societal norm today?

2. Definition of Key Concepts

Nwankwo (2017, p.117), citing Ekennia (2003, p.148), said, “abortion derives from the Latin infinitive *aboriri*, which means to perish.” Literally, it means the loss of a foetal life. Abortion is usually defined as the intentional destruction of the foetus in the womb, or any untimely delivery brought about with intent to cause the death of the foetus (Peschke, 1978).

Religion on the other hand is etymologically, derived from the Latin word *religio*. This was thought to have originated from the root *leg* or from another Latin verb *relegere* which meant “to re-read, or to ponder, or to take up, count or gather.” Such a root would suggest that ‘religion’ is “to observe (or gather) the signs of divine communication” (Iwuagwu, 1998). Nmah (1998, p.65) said, “in religion there are man’s efforts in satisfying emotional needs by establishing and maintaining cordial relations between himself, the super sensible world, and his fellow man.”

According to Obilor (2003, p.172), religion means: the whole complexus of attitudes, beliefs, practices, gestures, rituals, emotions, convictions, and institutions through which we express our deep fundamental relationship with Reality and not excluding the created order.

‘Morality’ in the words of Obaje (2002, p.22), in Kudadjie et al. (2002), “is usually considered as a way of regulating the conduct of individuals in

communities.” In other words, human conduct must be guided in order to avoid chaos in the society. Morality is further defined as “the quality of conforming to the principles of good conduct, moral or virtuous conduct” (Obaje, 2002). This boils down to the fact that morality covers good or bad, right or wrong principles of human behaviour. That is why we can say some of human actions are bad, some are morally good, and some are immoral.

2.1 Understanding the Socio-Religious Concept and the Morality of Abortion

In considering the subject matter, ‘abortion’ and its morality among the people of Okpokwu Local Government Area, the study first of all looked at the approaches of the people from where abortion law operates at parallel between the society and religion. This would help in giving a right judgment as to why religion may not have had a total control of abortion decision making in the focal area, considering the fact that sex related matters are not openly discussed by religious institutions in Okpokwu.

Religion and abortion are closely connected to political and social discourses in many parts of the world. Some major world religions express doctrinal disapproval of abortion and this condemnation is reflected in individuals’ stated beliefs (Amy, 2013). Research has demonstrated a strong connection between individual religiosity and negative abortion attitudes (Alvarez and John, 2008). Recent research shows that 47% agreed that abortion was morally wrong, with only 13% respondents saying that abortion was morally acceptable, and 27% stating that abortion is not a moral issue. At least 58% of Protestants, and Catholics were said to believe that abortion is morally wrong and only 20% of those who without an affiliation held this belief (PEW Forum, 2018). It was discovered that higher population women with religious affiliation, do obtain abortions irrespective of doctrinal restrictions of the practice (Jerman et al, 2016). Furthermore, studies have shown that religion has an inconclusive and context-specific influence in women when the issue of whether to terminate a pregnancy or not arises (Williams, 1982).

In Nigeria, abortion is a debatable and controversial topic wherever it is raised. Abortion in Nigeria is governed by two laws that differ greatly depending on geographical location. Northern Nigeria, where Okpokwu belongs, operates the penal code and Southern Nigeria is governed by the criminal code (Police Order, 2014). The only legal way to have an abortion in Nigeria is if having the child is going to put the mother's life in danger (UNPD, 2014). Many

Nigerian women seek unsafe abortion methods to avoid criminal and social penalties leading to abortion-related complications and increasing mortality and morbidity rate in the country.

In a joint study carried out by the society of gynecologists and obstetricians of Nigeria and Nigeria’s ministry of health, the number of women who engage in unsafe abortions was estimated at 20,000 each year (Raufu, 2002). Researchers have revealed that only 40% of abortions are carried out by doctors with a better health facility while the remaining percentage are performed by non-health experts (Henshaw, 2015). Throughout history, Nigerian abortion laws have galvanized several groups and interests with opposing views regarding the liberalization of abortion laws and the championing of women’s right.

3. Socio-religious Approaches and its Consequence on the Rate of Abortion in the Society

Christians’ views on abortion have been that of a long and complex experience. Churches’ opposition and condemnation of abortion goes back to the 1st century with texts such as the Didache, the Epistle of Barnabas and the Apocalypse of Peter (Frank, 2017). Some Christian writers have at one time or the other, argued that abortion was acceptable under certain conditions, especially when it aimed to save the life of the mother. However, this view did not become an accepted norm until some denominations change their views in the 20th century. The Bible itself does not contain direct references to abortion. It is true that the church has always condemned abortion, but the issue that concerns the ensoulment of an embryo, have led to changes in the Canon law when it comes to the classification of the sin of abortion (Ana et al. 2010).

Despite the secular perception on abortion in various quarters, systemic and socio-cultural barriers have restricted access to abortion services. Attitudes that relate to abortion emerge in policy making system, and at the level of the community (Kumar, 2009). Stigmatization of those who have procured abortions has a way it can influence people’s ability to exercise reproductive autonomy. Scholars are of the opinion that stigma confounds a woman’s decision to terminate a pregnancy due to fears about judgment. This includes isolation, safe-judgment, and community condemnation. Limiting legislations could be additional barriers to abortion access, where one desires to do so (Forthwith and Coleman, 2018).

3.1 Abortion: An Exit Door to Religious Stigmatization

In Nigeria, Okpokwu inclusive, women with abortion history are socially and religiously stigmatized. This may lead to experiencing difficulty in getting married by such victims. This is so because of the perception about them as being promiscuous and as potential victims of secondary infertility. Among the many factors that may be responsible for this stigma around abortion, religion remains arguably the most prominent (Oyediran, 2020).

It is a thing of wonder why people in a religiously and culturally valued society like Nigeria, will opt for abortion, an act that have so overtly been condemned. The only possible answer to this might be that women, usually shift from their religious views and go for abortion when faced with the reality of an unwanted pregnancy. This position is so because unwanted pregnancies have numerous socio-economic consequences that could make women jettison religiously held beliefs. This remains unclear because no known study has investigated the influence of religions on sexual and reproductive health care, utilization and behaviour of women (Arosell and Carlbom, 2016). However, Frohwirth (2018) showed that religion has no significant effect on abortion decision.

Many Nigeria people are well educated, which arguably help people escape the grip of religious “fanaticism that places religion above human life.” A case in point is the theory of secularization by Stijn and Guide (2015), which posits that, “religious beliefs are of nominal value when individuals experiencing socio-economic challenges make important life decision or willingness to keep a pregnancy.”

4. Cultural Beliefs towards Sex related issues in Okpokwu

Okpokwu is a local Government Area in Benue State, Nigeria. Its headquarters are in the town of Okpoga, located in the south of the town of Ugbokolo, in the Local Government Area (Atim, 2010). It has an area of 731km² and a population of 176,647 at 2006 census. Okpokwu has three districts which includes Edumoga, Okpoga and Ichama. It has a projected population of 253,500 in 2022 with the adolescents (aged 10-19) 39.155 per cent population. The people are predominantly famers with citrus fruits, maize, cassava and groundnuts as the main produce from the area (National Population Census, 2006).

The Idoma, of which Okpokwu belongs, is an ethnic group largely found in Benue State, Nigeria. They

have a rich cultural legacy that is intimately woven into their daily life. The Alekwu (ancestral gods) belief system promotes social norms and values by enlightening individuals about the consequences of going against them. Tamale (2023), explores the impact of cultural and religious beliefs on women’s sexual and reproductive rights in Africa. She argues that the belief in Alekwu (ancestral gods) punishing women for perceived sexual transgressions, contributes to the construction of women’s sexuality as source of moral concern and control. Thus, restricting their autonomy and decision-making power. The belief in Alekwu can be enforced on a woman’s infidelity as well as to a man or woman aiding abortion decision of their unmarried young women.

The power and the fear of the Alekwu, in enforcing punishment on sexual offenders cannot be over emphasized. Sexuality was seen as a sacred discussion and so it is not publicly spoken of between parents and youth or between sexual partners (Baker and Rich, 1999, Ajala, 2007). Sexual matters are not discussed in the public or at all between parents and their children, as this is seen as a taboo. When sexual issues are mentioned at all, they rather use euphemisms for body parts and activities. This has been noted to lead to confusion and communication difficulty, all in a bid to avoid discussing explicitly sexual matters. (Izugbara, 2005, Ojo, 2005).

Furthermore, the issue of abortion as is obtainable in Idoma culture, tends to punish the adults who contribute either financially or morally in aiding abortion of their children, and also the issue of adultery. Hence the issue of punishment for the offense of abortion is not totally held on the adolescents who commit such by the Alekwu (gods) of the Idoma. Therefore, sexual misbehaviour of the Idoma teenagers was not properly put under control when they come to the understanding of this reality (Wukari, 2023).

5. Factors Influencing Abortion Decision Making

The decision on how to terminate a pregnancy is influenced by a variety of factors at different levels and given circumstances. At the individual level these factors include: marital status, whether they were victims of rape or incest; economic independence and level of education (Gbagbo, 2015). Furthermore, interpersonal factors include: support from partners and parents. While social factors include: social norms and values, religious views, stigmatization as a result of premarital or extra-marital sex, social status, and freedom within society (Kabiru, Mutua and Izugbara,

2016). On the other hand, the organizational factors include: knowledge of sex education, availability of health care system, and abortion laws. These influence the decisions when abortion matters arise. All these factors are related to power and gender inequalities. They obstruct young women’s freedom and make them vulnerable to pressure.

Another important factor has to do with the effect of globalization in Africa. This has created an unprecedented cultural deviance, thus, eroding traditional African sexual values. According to Saliman, Akor and Abdullahi, (2021, p.47), “globalization has brought controversial issues in relation to human biological and social determinants, affecting their images and functional societal roles.” The incursion of western cultures and values into African, has come with it all forms of sexual orientations and consequent vices which are strange, such as, homosexuality, bisexuality, pan sexuality, asexuality and other sexual vices including abortion (Mehra et al. 2019).

These factors have given rise to sudden interest in the mainstream media and digital media, such as radio, television, computers, newspapers, journals, books, bill boards, theatre, recordings, films, and the internet. These have all negatively affected traditional African values through their content and development. Since sexuality is fundamental to human existence and widely regarded as the pulse of civilization by all Africans, regardless of tribe or religious affiliation, globalization rapidly redefines traditional African views and beliefs. Ojo and Fasubaa (2005, p.111), argue that, “sexual orientation and identity in Nigeria, especially teenage sexual activities, are significantly

changing from what they previously were.” Young adults usually leverage social media for information on sexual issues, rather than their parents or experts. The result of all these is usually catastrophic and regrettable.

Research Methodology

The study is based on the ex-post facto research design. It refers to the studies which investigate possible cause and effect relationship by observing an existing condition and searching back in the time for possible factors. Data for this study were generated using the qualitative and quantitative methods. The qualitative approach, involves collecting data from oral interviews and documents like textbooks, journals, magazines, newspapers and internet materials. The quantitative approach through the use of structured questionnaire, which were analyzed in tables, using simple percentage.

Results and Discussions

Research Results

Responses from the 15 questions structured questionnaire copies are given below as reflected in the area of the study.

Tables of Sampled Results

Key to the Tables

Ben Poly: Benue State polytechnic, Ugbokolo

ICSS: Ichama Community Secondary School, Ichama

WHS: Wesley High School, Ojapo

GSS: Government Secondary School, Okpoga

ATR: African Traditional Religion

Table 1: Religious affiliation of Respondents

Sampled group	Christianity	ATR	Islam	No Affiliation
Ben Poly	24%	1%	1%	0%
ICSS Ichama	25%	0%	0%	0%
WHS Ojapo	25%	0%	0%	0%
GSS Okpoga	24%	0%	1%	0%
Total percentage	98	1	1	0

Source: Field Survey, 2024

Table 1 showed that Christianity, with 98%, indicated her dominance in the area

Table 2: Institution where abortion related issues are discussed

Simple Percentage (%)				
Sampled group	Religious group	Among Friends	Home	Media
Ben Poly	0%	5%	2%	15%
ICSS Ichama	2%	12%	3%	8%
WHS Ojapo	2%	10%	4%	9%
GSS Okpoga	1%	11%	3%	10%
Total percentage	5%	41%	12%	42%

Source: Field Survey, 2024

Table 2 indicated that abortion discussions are mostly done within Friends 41%, Internet/Media 42%, at home 12% and religious gatherings 5%. Therefore, teenagers mostly get information about abortion from the internet and friends.

Table 3: People responsible for the abortion of adolescents

Simple Percentage (%)				
Sampled group	Gov. institution	Private Institution	Drugs sellers	Self means
Ben Poly	0%	8%	15%	2%
ICSS Ichama	0%	5%	17%	3%
WHS Ojapo	0%	8%	16%	1%
GSS Okpoga	0%	6%	18%	1%
Total percentage	0%	27%	66%	7%

Source: Field Survey, 2024

Table 3 shows that 66% of abortion among adolescents are carried out by quacks and patent drug sellers. As such this results in complications due to unprofessional handling. Private clinic with 27% are also promote abortion. Government hospitals do not promote illegal abortion with 0% assistance.

Table 4: Sexuality and sexual relations among teenage

Simple Percentage (%)			
Sampled group	Increasing	Decreasing	No difference
Ben Poly	9%	5%	11%
ICSS Ichama	7%	6%	12%
WHS Ojapo	8%	4%	13%
GSS Okpoga	10%	5%	10%
Total percentage	34%	20%	46%

Source: Field Survey, 2024

Table 4 shows that sexual activities among the people of Okpokwu is high. Premarital sex among teenagers is increasing with 34%, decreasing rate at 20%. Others believe that the remained constant at 46%.

Table 5: Initiators of Abortion Decision making

Simple Percentage (%)			
Sampled group	The pregnant girl	The boy who impregnated her	The parent of the pregnant girl
Ben Poly	18%	6%	1%
ICSS Ichama	21%	3%	1%
WHS Ojapo	17%	6%	2%
GSS Okpoga	16%	7%	2%
Total percentage	72%	22%	6%

Source: Field Survey, 2024

Table 5: Abortion decisions are mostly done by the pregnant girls 72%, their boyfriends, 22% and their parents 6%. Each of these players have reasons for such decisions.

Table 6: Type of drug for abortion in the community

Simple Percentage (%)		
Sampled group	Pharmaceutical drug	Herbal drug
Ben Poly	22%	3%
ICSS Ichama	23%	2%
WHS Ojapo	24%	1%
GSS Okpoga	24%	1%
Total percentage	93%	7%

Source: Field Survey, 2024

Table 6. Here pharmaceutical drugs (93%) are mostly used for abortion in Okpokwu. Though local means (7%) are also available.

Table 7: Effectiveness of the common drug used for abortion

Simple Percentage (%)			
Sampled group	Effective	Have complications	To some, it is effective and to others it have complications
Ben Poly	5%	3%	17%
ICSS Ichama	2%	2%	21%
WHS Ojapo	2%	1%	22%
GSS Okpoga	2%	3%	20%
Total percentage	11%	9%	80%

Source: Field Survey, 2024

Table 7. It would also be interesting to note the accessible means of abortion in Okpokwu have 50% chances of effectiveness and complications. This effect can be immediate or later. The table gave 80% responses to uncertainty of abortion effectiveness.

Table 8: Position of religions on abortion among the adolescents

Simple Percentage (%)		
Sampled group	Yes	No
Ben Poly	0%	25%
ICSS Ichama	0%	25%
WHS Ojapo	0%	25%
GSS Okpoga	0%	25%
Total percentage	0%	100%

Source: Field Survey, 2024

Table 8 shows that religion is 100% against abortion.

Table 9: Motivational factor to premarital sex

Simple Percentage (%)			
Sampled group	Money	Name tagging/pressure from friends	Sexual enjoyment
Ben Poly, Ugbokolo	16%	7%	2%
ICSS, Ichama	21%	4%	1%
WHS, Ojapo	17%	6%	1%
GSS, Okpoga	19%	5%	1%
Total Percentage	73%	22%	5%

Source: Field Survey, 2024

Table 9. Premarital sex in Okpokwu is controlled by money at 73%, name tagging/pressure from friends 22% and sexual pleasure 5%. Economic and social issues are leading causes of premarital sex that induce the pressure of abortion in Okpokwu

Table 10: Morality of abortion in the community

Simple Percentage (%)		
Sampled group	Yes	No
Ben Poly, Ugbokolo	0%	25%
ICSS, Ichama	0%	25%
WHS, Ojapo	0%	25%
GSS, Okpoga	0%	25%
Total Percentage	0%	100%

Source: Field Survey, 2024

Table 10. To find out the morality of abortion in Okpokwu, our respondents agreed 100% that abortion was morally wrong.

Table 11: The effectiveness of the government in enforcing abortion law in the community

Simple Percentage (%)		
Sampled group	Yes	No
Ben Poly, Ugbokolo	0%	25%
ICSS, Ichama	0%	25%
WHS, Ojapo	0%	25%
GSS, Okpoga	0%	25%
Total Percentage	0%	100%

Source: Field Survey, 2024

Table 11 shows that Government commitment in the control of abortion practices received 100% failure. This fact is coming from the respondents' opinion.

Table 12: Accessibility of drugs for abortion in the community

Simple Percentage (%)		
Sampled group	Yes	No
Ben Poly, Ugbokolo	22%	3%
ICSS, Ichama	17%	8%
WHS, Ojapo	19%	6%
GSS, Okpoga	13%	12%
Total Percentage	71%	29%

Source: Field Survey, 2024

Table 12. The drugs for abortion are accessible at 71% and inaccessible at 29%. People who are confronted with abortion decisions can easily opt in due to the ease in acquiring the drug.

Table 13: Affordability of abortion drug by adolescents

Simple Percentage (%)		
Sampled group	Yes	No
Ben Poly, Ugbokolo	8%	17%
ICSS, Ichama	12%	13%
WHS, Ojapo	14%	11%
GSS, Okpoga	13%	12%
Total Percentage	47%	53%

Source: Field Survey, 2024

Table 13. Affordability of abortion drug stands at 47% and 53% unaffordable. Meaning that almost half of the people can buy the drug. And so, abortion decisions could be easy to take.

Table 14: The attitude of religious body to sex education campaigns

Simple Percentage (%)			
Sampled group	One to three times/year	Four to Ten times/year	Not at all
Ben Poly, Ugbokolo	20%	0%	5%
ICSS, Ichama	18%	0%	7%
WHS, Ojapo	17%	0%	8%
GSS, Okpoga	19%	0%	6%
Total Percentage	74%	0%	26%

Source: Field Survey, 2024

Table 14. Sex education campaign responses indicated that more needed to be put in place by religious bodies to be able to address adequately the trends from the internet/social media.

Table 15: Religious stigmatization/punishment and adolescents' quest for premarital sex test: (effects on adolescents' sexuality)

Simple Percentage (%)		
Sampled group	Yes	No
Ben Poly, Ugbokolo	3%	22%
ICSS, Ichama	2%	23%
WHS, Ojapo	1%	24%
GSS, Okpoga	4%	21%
Total Percentage	10%	90%

Source: Field Survey, 2024

Table 15. Shows that stigmatization and suspension by religious bodies gave 10% success and 90% failure. Indicated that abortion decisions are not directly corresponding to individual's religiosity.

6. Discussion of Research Results

The discussion of this research attempted to give a general overview of the socio-religious and moral implications of abortion in Okpokwu. Morality is subjective and selective in nature base on the perspective of individual players. Abortion on the other hand, is a vice that is controlled by so many factors and variables: interpersonal and intra-personal; as well as organizational factors. Religion as one of the organizational factors was considered in this study. In the study of human behaviour, a lot of factors are considered to be able to give a fair judgment on the reason while certain behaviour is always seen. That is why in research analysis, so many variables and a

control is set in order to note the angle from where the change or issue in focus is coming from.

Abortion is such a dynamic and controversial issue in social sciences and religion. It has generated so many contributions in an attempt to give a possible solution to the vice as it affects the entire humanity. These contributions range from imposition of abortion laws enacted to stop people from the act and giving a waiver for some unavoidable conditions like as to when the mother's life is in danger. Notwithstanding, the incidence still recorded a steady growth.

The proof of religious activities on the issue of abortion in the society's moral institution was identified in this study. The finding shows that religion makes no much impact on the rate of abortion in Okpokwu. This does not mean that religion has totally failed, the findings indicated that some other factors are responsible for this resistance from the pro-abortion advocates.

Researchers like Cooper; Forhwirth; Stijn and Guido (2018), were recently on the stance, claiming the shift of religious relevance on abortion due to religious restrictiveness. They opined that other factors like age grades, parents' sex education and other social and economic factors are now responsible for teenage abortion decision-making. These researchers came to align with the above claims considering the fact of the socio-religious loopholes as observed from both cultural and religious ways of addressing sexual issues in the study.

Firstly, Christianity and also the culture of the people of Okpokwu rooted in African traditional religions, sees sexuality as a taboo in both social gatherings and private discussions. This was the principles used to take away the attention of the young people of the community from sexual related issues. But nowadays, teenagers are more inquisitive to know virtually everything that comes to mind, hence a shift of attention of teenagers from the laid down societal norms and values to the global world for sexual information.

Secondly, the Alekwu belief system is seen to punish the adults, as expressed by Tamale's research. The knowledge of this reality in the lives of teenagers, who are faced with sexuality issues, tends to play down the belief as an excluded group in the game. Therefore, the teenagers now use the opportunity to tap into other alternatives available in satisfying their sexual related issues.

Thirdly, the non-inclusiveness of sexuality in religions' discusses was the main reason why teenagers opt for other means of expressing this feeling. For religion, abstinence was the teaching but the other underlying feeling that youths face during adolescence will get an answer from the secular or media sources. This answer may be right or wrong but because the hood of morality (religion) is not ready to provide answers that are helpful, by not talking about sexuality, whatever comes their ways are acceptable.

The questionnaire responses were loud enough to speak the same language as to the complexity of sexuality and abortion related issues in Okpokwu. These factors range from the availability and accessibility of drug for abortion, availability of quacks all over that facilitates abortion, social factors that press hard on the teenagers or sometimes their parents inclusive, are forcing them to take the hard decision of aborting their pregnancies; made is so complex for a general conclusion on the where to point actually. People's understanding about this facts of abortion differs as the condition that led to someone's

abortion decision making, might not be the same with another person's condition.

Still from the questionnaire as observed in number 15, the alarming responses of the respondents showed that suspension approach taken by the religious bodies and stigmatization labeled on abortion, was not a lasting solution to solving the issue of abortion and sexual misconducts among the adolescents.

There are some key players that tend to model the contemporary adolescents. These players according to this work identified pregnancy stigmatization, globalization, social realities and host of others as contributing factors. The inconclusive debates among abortion advocates and the prolife groups makes the choice on the morality behind abortion so ambiguous. Therefore, the morality of abortion now lies on individual judgments despite the restrictive laws and norms in operation in Okpokwu.

Nevertheless, the role of religion in the modeling of behaviour would still come to its relevance if aggressive sex education receives an urgent attention from the religions bodies.

7. Conclusion

In reference to the above findings, it is worthy of note, that religion has lost its place in the sex life of the community, as the customary way to addressing sexual offenders no longer yield positive results. The global world and social realities have now assumed the place of religion in the lives of our young women. It is also to be understood that sexual issues are natural issues and religion must not run away from it. If religion must get the attention of the young and sexual deviants, she must be ready to address their corresponding natural or sexual issues.

8. Recommendations

This study thus recommends that:

- Religious bodies should embrace the line of counseling to deviant members before pronouncing disciplinary measures to sexual offenders.
- Aggressive sex education should be advanced as a measure to solving the issue of sex related vices in Okpokwu
- Appropriate arms of government and traditional leaders should wake up to their responsibilities in the control measures to abortion laws at all spheres.

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Digitalization and Employee Productivity in Nigeria

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Abstract. Digitalization is an important tool for organization for effective performance and sustainability. The advent of covid-19 increased the need for digital innovations in organizations. This study is earmarked to find the impact of digitalization on employee productivity. With 200 copies of structured questionnaire, respondents constituted the sample size, and the resulting data was analysed descriptively using SPSS. The study found that with digitalization in organizations proxied by reduction in-person to person interactions, job autonomy and work-life family balance has improved employees' productivity. Also, the study showed that telecommuting as a digital technology has helped increase employee productivity level. The study concludes that employee productivity is a means to improve customer expectations.

Keywords: Digitalization, Employee Productivity, in-person interaction, Work-family balance, Job autonomy, Telecommuting.

1. Introduction

Man by nature is a social being and must interact with his environment for the achievement of certain goals or plans. An organization too, depends on this social nature of man to also achieve its set goals and objectives for its survival and growth. According to the Global Outbreak Alert and Response Network (GOARN), the first case of Coronavirus disease was recorded on 31 December 2019, in Wuhan China. With its rapid spread around the world, it became difficult for man to effectively interact with his environment in person. With the outbreak of the coronavirus pandemic, the global business environment has suffered a reverse and decline in growth with the pandemic influencing all aspects of human and organizational existence. However, the

impacts on the global economic activity cannot be overemphasized as it cut across areas such as a reduction in consumers spending habit, increased unemployment rate, increased operating expenses of organizations. According to López-Arellano, Romero-Rubio, Sandoval-Félix, and Vega-Arellano (2023) the pandemic has significantly affected the work life and productivity of employees.

Since organizations cannot operate in a vacuum, especially ones created by the pandemic, critical measures in meeting the demand of the environment needed to be adopted. After the pandemic, digital technologies became very instrumental as they played the crucial role of facilitating the continuity of the regular day to day living as well as connecting people within and outside an organization more than at any other time in the history of digitalization.

The post covid era saw many organizations in the world, including Nigeria, implementing the use of digital technologies in attending to their job responsibilities. Kimondo (2020) conducted a study on the challenges of telecommuting in the effective management of staff in Kenya during the COVID-19 era, found out that by using digital technologies, made it possible for middle level managers to effectively communicate with employees and keep close tab on the progress of employees. However, in Nigeria, the use of digital technologies or telecommuting is still a practice that is unfamiliar among most workers and there is dearth of research in Nigeria on how digitalization in post covid affected employee productivity. Therefore, the broad aim of this study is to examine the impact digitalization has on employee's productivity in a post COVID era in Nigeria.

2. Conceptual Review

2.1 Concept of Digitalization

Gbadegeshin (2019) described digitalization as the process of organizational application or adoption of modern digital technologies to any activity carried out by man, such as personal, economic, social and political activities. Urbach and Ahlemann (2019) gave a broader definition, when they defined digitalization as the utilization of technological innovations in the business environment that has a positive impact on the business process, supply chain, sales of goods and services. In relation to organizational business processes, digitalization in any form may refer to the use of digital computing tools with the aid of the different web platforms that facilitate fast work processes.

In relating digitalization to the context of organizational workplace, De Bruyne and Gerritse (2018), opined that the digital working environment of an organization affects people in the aspect of how they engage and corporate with others within the organization including other stakeholders. As one of the biggest and ever-changing aspects of business in the world, digitalization continues to play a crucial role in reshaping and repositioning the way businesses carry out their respective activities globally (Schreckling and Steiger, 2017). This no doubt implies that by adopting the use of digital technologies in an organization or business process, the role of employees within the organization may change, thus reshaping or redefining the job responsibility of employees.

2.2 Digitalization and Reduction in Person Interaction

Digitalization in organizations has led to redesigning of business models and influence of work behaviour and performance (Barley, 2015; Verhoef et al., 2019). The virtual environments where organizations operate impact relationships and interactions between the employees on one hand and the employees and consumers on the other hand (Empson and Howard-Grenville, 2021). In the post covid era, there has been an increase in dynamics causing a global acceptance of digital technologies in organizations (Bellis, Trabucchi, Buzanza, and Verganti, 2022). This new practice has come to stay and as such values, purposes and norms will be reviewed overtime (Frisch and Greene, 2021). Thus, it is imperative that new skills, attitude and knowledge be adopted to effectively relate with one another (Mysirlaki and Paraskeva, 2020).

Within the context of organizations, digitalization of work activities will include the use of digital

technologies such as telecommuting which is a core tool in this study to facilitate relationships and interactions (Schwarzmueller, Brosi, Duman and Welp, 2018). Contrarily, Iannotta Meret, and Marchetti, (2020) and Frisch and Greene (2021) noted that digitalization impedes the spontaneity of interactions due to absence of chance events and unofficial gathering by directly impacting trust-building and communication.

2.3 Digitalization and Work-Family Balance

According to Munusamy (2016), work-family balance is defined as the organizational working policy that enables employees to effectively balance work and other family responsibilities. It is the situation where an employee can attend to both their personal and work responsibilities without any conflicting interests. Molina (2023) further opined that flexibility brought about by telecommuting is a contributing factor to effectively balance work and family life due to workers flexible working time and location. Um, Kou, Waldrep and Gerson (2024) further added that work-family balance is been achieved because telecommuting affords employee the ability to manage their time and engage in other activities, like recreational activities and spending time with loved ones.

2.4 Digitalization and Job Autonomy

Hema and Rajoo (2023) defined job autonomy as the degree of significant freedom, independence and discretion given to employees by employers to carry out their assigned task or work. Khoshnaw and Alavi (2020) further added that job autonomy can be classified into two specific areas of having autonomy over work approach and work timing or schedule. Yeung and Hao (2024) further suggest that in telecommuting, employees require and enjoy job autonomy since they are to perform their job responsibilities without the constant scrutiny of employers. Huu (2023) cited the significance of digital competence and job autonomy in encouraging workers ingenuity, learning, and sharing knowledge. Huu (2023) further acknowledged that employees with greater digital job autonomy are more committed to work improved work performance, thereby leading to improved employee productivity.

3. Telecommuting in Nigeria Organizations

According to Onyemaechi, Chinyere, and Emmanuel (2018), telecommuting, permits employees to be more adaptable and flexible as regards their job schedules, thereby helping them to quickly respond to emergency

needs within the organization. Telecommuting has been described as the process of utilizing technological means that makes it possible for employees to perform their job responsibilities remotely, without necessarily reporting to the workplace (Ye, 2012). Jaafar, and Rahim (2022) suggests that telecommuting can prove to be beneficial to employees in job autonomy, work-family balance and on the level of work stress.

3.1 Challenges of Telecommuting in Nigeria Organizations

Although telecommuting help employees as well as employers to remain relevant whether physically present on the job or not, they continue to perform their job responsibilities to meet organizational goals and objectives, there are still challenges that comes with this practice such as adaptability to telecommuting program of an organization, fear of trusting employees to deliver effective performance and the risk of information security (Omolawal, 2023). Sam (2019) identified some factors that contribute to digital inequality in Nigeria include lack of education, low income and poor electrical infrastructures. However, according to Daniels (2017) there is an ongoing collaborative effort between government and tech giants like Google, Microsoft, Intel and Chub to curve the inequalities or digital deficiency in Nigeria through the creation and support of e-learning facilities. According to Chitanana (2019), digital inequality can have adverse effects to Nigerians such as lack of compendious learning and youth stability.

To solve these problems brought about by the digital inequality or divide in Nigeria, Chitanana (2019) and Sam (2019) suggested the availability of e-learning digital technologies and ICT infrastructure; provision of computers to citizenry initiative (Daniels, 2017); updating existing facilities to improve the digital participation of the country (Odeh and Akinade, 2017).

4. Employee Productivity

Nasirzadeh and Nojedehi (2015), recently defined employee productivity in the construction industry, as the ratio between completed work done, and the total amount of time used in carrying out the assigned task. Similarly, Iqbal, Ahmed, and Allen (2019) defined employee productivity in terms of impersonal trust, which they argued that absence of trust between co-workers and employers can result in lower productivity of employees. Hasan (2016) opined that there is a direct relationship between employee productivity and organizational growth, since employees are agents through which organizational

goals and objectives are met. According to Stevenson (2009) some new factors that now affects employee productivity includes; technology choice of the organization, quality of services offered by the organization, the capital type employed by the organization, internet networking system of the organization, new workers, lack or shortage of ICT workers, virus affecting computer system within the organization and the breakdown of machines in the organization.

4.1 Maintaining Employee Productivity in a Post COVID Era

The surge of COVID-19 around the world has led to organizations adopting new ways to conduct their business. As observed by organizations, the pandemic has led to the increase in the workload of those employees remaining in certain organization, as well as also bringing about some changes in the employment agreement of other employees such as the introduction of part time workers and telecommuters (teleworkers). With the help of digitalization, some employees can carry out their job responsibilities from home. However, according to research carried out by ILO (2020), show that employees that work from home with the help of digital technologies tend to work longer hours including at nighttime. This finding is in unison with the study carried out by Anakpo, Nqwayibana, and Mishi, (2023) who observed that by working from home, employees put in extra hours working on organizational projects. Due to the work-from-home policy in most organizations, there has been a separation of work groups.

Also as noted by Bick, Blandin and Mertens (2020) some employees using digital technologies in carrying out their assigned job responsibility, may lack the necessary experience especially those required to work from home both during and after the COVID saga, as this is regarded as a “new normal” which they may require time to master.

5. Theoretical Review

The goal-setting theory proposed by Edwin Locke in 1968 suggests that the goals an individual employee set for himself play a key role in motivating him for superior productivity. Adding that managers will need to develop the skill of knowing how to engage employees in mutual goal setting exercise corresponding employee expectations with organizational goals and provides feedback on their regular performance. In the goal-setting theory Edwin Locke (1968) noted that the ability of employees' achieving to their goals is through the creation of work

environment that is considered fit, comfortable, satisfactory, and motivating to employees. Thus, an environment with the right technology will improve employee's productivity and organizational goals.

6. Methodology

6.1 Research Design

Saunders and Lee (2017) defined a research design as the means intended to conduct the work. The survey research allows for a sizeable amount of reliable data to be collected as it involves the sampling of representatives of the population to proffer solutions to research questions (Bryman, Bell, and Harle, 2015). Thus, the survey research design was adopted for this study.

6.2 Population, Sample Size and Sampling Technique

The sample size of this study consists of 200 staff of a Federal Institution in Benin City, Edo State. The staff comprises of both academic and non-academic staff of the institution. The population was gotten from the records of the Registrar’s Office in 2024. The study adopted the stratified and simple random sampling technique in obtaining the sample size conveniently. The stratified sampling technique ensured employees from various departments were captured in the study; thus, they were divided into strata. While the simple random sampling ensured that all employees had a fair and equal chance of been selected into the sample.

6.3 Research Instrument, Validity and Reliability of Research Instrument

Bryman and Cramer (2012) asserted that data collection and analysis are reliant on the methodological approach used. Since the survey research involves the collection of primary data, the questionnaire response format was the data collection instrument. Primary data are the first-hand experience collected data that are reliable, authentic, and objective (Kabir, 2016). Being a survey research design, copies of questionnaire were distributed to elicit required data.

The basic requirement for a good measurement is content validity, which means that the measurement items in an instrument cover the major content of a construct. Thus, a pilot study was conducted and reviewed by five academics to comment on the appropriateness of the research constructs. Based on their feedback, redundant and ambiguous items was either modified or eliminated. While Cronbach’s alpha which measures the internal consistency among indicators, had a high value of 0.86.

6.4 Model Specification

The model depicts the functional relationship between digitalization and employee productivity. The SMART PLS software was employed in performing the regression analysis.

Model:

$$EP = f(IPI, WLB, JA, TECO) \dots\dots\dots (1.1)$$

Econometrically, the model is stated as:
 $EP_i = \alpha_0 + \alpha_1 IPI_i + \alpha_2 WLB_i + \alpha_3 JA_i + \alpha_4 TECO_i + \xi_i \dots\dots\dots (1.2)$

Where:

- EP = Employee Productivity
- IPI = In-Person Interaction
- WLB = Work-Life Balance
- JA = Job Autonomy
- TECO = Telecommuting
- ξ = Error term

A priori sign/ expectation: $\alpha_0 > 0, \alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0 \dots\dots\dots (1.3)$
 α_0 = Parametric constant, $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ = Parametric coefficient

6.5 Data Analysis and Interpretation

This section provides a detailed description of the demographic information of respondents that were sampled in the study. This information can be seen from the table below:

Table 1: Staff Demographic Information

Variable	Category	Frequency	Percentage
Gender	Male	115	57.5
	Female	85	42.5
	Total	200	100.0
Age	18-25	50	25.0
	26-33	111	55.5
	34-41	35	17.5
	42-above	4	2.0
	Total	200	100.0
Education	SSCE	21	10.5

	ND	39	19.5
	HND	63	31.5
	BSC	71	35.5
	MSC	6	3.0
	PHD	0	0
	Total	200	100.0
Staff	Non-Academic	50	25.0
	Academic	150	75.0
	Total	200	100.0
Digital Usage	Yes	199	99.5
	No	1	0.5
	Total	200	100

Source: Researcher’s Fieldwork and Computation (SPSS 22.0) 2024

Table 1 above shows the demographic data of respondents. Where it was seen that from the total number of respondents in the study, 115 (57.5%) were male and 85 (42.5%) were females. Thus, we can say that there were more male in the study. The table also considered the age of respondents, and it was seen that 50 (25.0%) were between the ages of 18-25, 111 (55.5%) respondents were between 26-33 years of age, 35 (17.5%) were respondents between the ages of 34-41 and 4 (2.0%) were 40 years and above. From this we can see that the workforce is made up of young and vibrant individuals.

This section further analyzed the highest educational level of respondents, where it was discovered that 21 (10.5%) respondents were SSCE holders, 39 (19.5%) were ND degree holders, respondents with HND degree were 63 (31.5%) of the total population, 71 (35.5%) respondents were BSC degree holders and 6 (3.0%) were MSC degree holders. The table also considered the category of workers, where it was seen that from the total number of respondents sampled, 50 (25.0%) were non-academic staff, while 150 (75.0%) were academic staff. Lastly, the table also analyzed if employees made use of digital technology during the COVID era, 199 (99.5) of respondents said yes, while 1 (0.5) respondent said no. therefore we can see that the number of employees that made use of digital technology in carrying out their job responsibilities during the COVID era supersedes those that did not.

7. Data Analysis and Presentation

Here, the factor loadings for each item, validity and reliability is presented below:

Exploratory Factor Analysis

Table 2: Pattern matrix shows the factor loadings for each of the factor.

Item	F1-IPI	F2-WLB	F3-JA	F4-TECO
Digitalization				
IPI1	0.811			
IPI2	0.798			
IPI3	0.717			
IPI4	0.735			
WLB1		0.782		
WLB2		0.722		
WLB3		0.792		
WLB4		0.757		
JA1			0.624	
JA2			0.601	

JA3			0.609		
TECO1				0.821	
TECO2				0.869	
TECO3				0.842	
TECO4				0.795	
Item					
(b) Employee Productivity	F1-EP				
EP1	0.798				
EP2	0.796				
EP3	0.863				
EP4	0.877				
EP5	0.762				

Source: Researchers' computation (2024)

Assessing Validity

The table below present means, standard deviations, and reliability. Nunnally (1978) noted that values above 0.70 is acceptable.

Table 3: Means, standard deviations, and reliability of (a) digitalization and (b) employee productivity

Variables	Mean	SD	1	2	3	Reliability
(a) Digitalization						
1. In-person interaction	4.61	0.4	-			0.803
2. Work-Life balance	4.83	0.4	0.12*			0.794
3. Job Autonomy	4.52	0.3	0.620	0.27**0		0.718
4. Telecommuting	4.67	0.4	.29	.14	0.06*	0.841
(b) Employee Productivity						
	4.79	0.53				0.843
** . Correlation is significant at the 0.01 level (2-tailed).						
* . Correlation is significant at the 0.05 level (2-tailed).						

Test of Hypotheses

The results of the regression analysis are presented below:

Table 4: Result for regression analysis

Hypothesis	Relationship	t-statistics	p-value	Result
H1	IPI1-EP	3.634	.021	Supported
	IPI2-EP	4.221	***	Supported
	IPI3-EP	5..317	***	Supported
	IPI4-EP	3.945	.022	Supported
H2	WLB1-EP	6.325	***	Supported
	WLB2-EP	5.873	***	Supported
	WLB3-EP	7.742	***	Supported
	WLB4-EP	5.384	***	Supported
	JA1-EP	5.773	.023	Supported

H3	JA2-EP	6.313	.059	Unsupported
	JA3-EP	4.446	.063	Unsupported
	JA4-EP	3.601	.057	Unsupported
H4	TECO1-EP	6.732	***	Supported
	TECO2-EP	4.518	***	Supported
	TECO3-EP	8.399	***	Supported
	TECO4-EP	2.074	.032	Supported
	TECO5-EP	2.177	.030	Supported

Source: Researchers' computation (2024)

The statistical significance of Hypothesis 1 confirms that digitalization has high impact on employee productivity with t-value above 1.96. However, the impact from each item on employee productivity differs. Hypothesis 2 shows that there is a significant and positive relationship with employee productivity with t-value above 1.96. Hypothesis 3 shows that there is an insignificant but positive relationship with employee productivity with t-value above 1.96. Lastly, Hypothesis 4 reveals a positive and significant relationship with employee productivity.

8. Discussion of Findings

In-person Reduction

Generally, it was found that while in-person interactions (face to face) were reduced, the use of digital technologies made work easier and productivity higher. These findings corroborate with Verhoef et al., (2019) that digitalization in organizations has led to redesigning of business models that has invariably impacted positively work performance and productivity of workers.

Work-Family Balance

Findings showed that telecommuting during the COVID era helped staff to meet both organizational and family needs. More so, telecommuting helped increase their productivity level and being able to spend time with their respective families. Findings of Molina (2023) support the position of this study that flexibility brought about by telecommuting is a contributing factor to effectively balance work and family life due to workers flexible working time and location.

Job Autonomy

The study found telecommuting as a digital technology afforded employees the opportunity to

work at their own pace. Findings according to this study showed that by telecommuting during the COVID era, employees had the responsibility to make more decisions on the job and had more control. Huu (2023) empirical evidence supports this study by revealing that employees with greater digital job autonomy are more committed to work improved work performance, thereby leading to improved employee productivity. Thus, organizations should create a supportive and collaborative environment to improve digital job autonomy of employees.

Telecommuting

Through the course of this study, it was discovered that the adoption of digitalization during the COVID era was instrumental to the meeting of organizational goals and improving employee productivity. The study discovered that telecommuting which was one of the various ways in which some employees carried out their job responsibilities, made it possible for employees to have more job autonomy which gave them the opportunity to work at their own pace, more decision making and control. These findings support the study of Onyemaechi, et al (2018) that telecommuting permits employees to be more adaptable and flexible as regards their job schedules, thereby improving employee productivity. It was also discovered that through telecommuting, employees were able to achieve both organizational and family need as they get to spend more time with their families while also paying attention to their job responsibilities and this as seen in the study helped in improving the productivity of employees.

Challenges

The challenges faced by employees in the adoption of digital technology and telecommuting during and after the COVID among the staff according to the descriptive analyses showed that adopting digitalization is more expensive than in-person service

delivery and that using digital technology require having special knowledge. Furthermore, poor facilities, lack of maintenance and poor network signal can restrict the flow of information and can affect work productivity. Despite, ongoing collaborative effort between government and tech giant to curb the inequalities or digital deficiency in Nigeria through the creation and support of e-learning facilities, Sam (2019) identified some challenging factors of telecommuting in Nigeria that support the findings of this study as lack of education, low income and poor electrical infrastructures.

Despite the success of digital technologies, the study showed that challenges such as the cost of adopting digital technology, cost of training, lack of maintenance and poor network coverage especially for those working remotely from home still exist in Nigeria. Nevertheless, it was discovered employees that made use of digital technologies during the COVID era were generally productive as the organization continued to meet its obligations to employees and their customer base across the country.

9. Conclusion

Employee productivity is one way in which organizations can effectively meet consumers' expectations of receiving quality goods or service as without improving on the productivity of employees within the organization will gradually lead to the loss of consumers or organizational customer base. This was without doubt in the COVID era as the uncertainty that accompanied global pandemic greatly affected the productivity of employees in most organizations which saw the collapse of some businesses while organizations that were able to navigate through the sea of uncertainty during the COVID era by ensuring that they increased the productivity of their employees continued to thrive even to the post Covid era. To this end, it is important for organizations to continue putting resources in place that will help them improve or develop new and innovative ways in which they can adopt digitalization in their business operation as this will be instrumental to their longevity in the business environment and meets the business long term goal and objectives.

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Impacts of Herdsmen Attacks on the Religious Worship and Activities of Apa Local Government Area, Benue State

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Abstract. This paper examined the impacts of herdsmen attacks on religious worship and activities of Apa Local Government Area of Benue State. The research aimed at considering the attacks of herdsmen on religious worship and the disruption of other activities in Apa. Historically, herdsmen have been very friendly with farmers and host communities in Apa, but today, the reverse is the case, as they have become a source of misery and worries. Communities and religious worship places are usually their targets and these have left much to be desired in the local communities. Over two decades now, records of herdsmen attacking people in churches, wounding, maiming, and killing in Benue State, have formed headlines of the major national dailies and other news outlets in Nigeria. The work adopted descriptive and analytical methods, while data were elicited from both primary and secondary sources, to address the issues raised. The findings revealed that herdsmen attacks were caused as result of struggle for meager resources such as water and farmland, the Islamization agenda and conspiracies. These have led to the destruction of farm crops, raping, kidnapping, land trespass, lack of respect for host communities, loss of lives, destruction of religious worship places, displacement of people, and homelessness. The work recommended that the Church should encourage dialogue, peace mediation and reconciliation, and intensify prayers to end the menace. On the other hand, security agents should work with the community leaders in securing the local communities. They should step up actions in disarming herdsmen with firearm and be bold to prosecute culprits and discourage violence. This research will be of immense relevance to religious institutions, farmers, herdsmen, Benue State, Nigeria, and Africa as a whole.

Keywords: Herdsmen, attack, religion, worship, Apa.

1. Introduction

The prevalence of Fulani herdsmen attacks poses serious threats to religious institutions and places of worship in Apa Local Government Area of Benue State. The worship life and activities of many religious groups, which used to be accompanied with joy, fellowship, and a feeling of divine presence, is no longer a thing to reckon with today. Christian Churches are mostly affected here. Activities such as Bible study, vigil, prayer meetings, and Sunday services have been disrupted and paralyzed. The coming together of people in church, mosque, and other social assembly do not thrive anymore. Worse of it, many villages and churches have been destroyed, and many people deserting the affected villages. Fulani herdsmen attacks have resulted in the death of many people, loss of lives, destruction of farmlands and crops, disruption of economic and social activities, severe relationships between farmers and herdsmen, and many persons abandoning their villages and becoming refugees in strange environments.

J. Omaji (personal communication, 11th September, 2024), observed that the causes of herdsmen attacks on places of worship, especially churches, could be traced to “the herdsmen Jihadist agenda, an attempt to Islamize and takeover Benue State, mostly populated by Christians, struggle to displace farmers and farming on cattle routes.” The impacts of this have always been in the negative, resulting to constant destruction of farm crops, confrontation from herdsmen, pollution of water, kidnapping, raping of women on the farm by herders, and among other things. Today Apa communities have been practically dislocated in all facets. People today live in fear and cannot congregate in places of worship to have fellowship, while others have been displaced and live like strangers in their homeland.

This work, through qualitative approach, examined the nexus of herdsmen attacks on religious worship in Apa. It took into consideration factors that led to

this menace, the impacts, the position of the church and a way to resolving the challenge. Finally, the work recommended that herdsmen and religious institutions should embrace dialogue, understand each other and return to those good old days when they have lived together in peace and harmony.

Explicating the Key Concepts

Nwankwo, (2017, p.11) defined religion as, “that ideological but irresistibly endearing force of Reality which encompasses and overwhelms the whole essence of man; an overt recognition of the covert experience of the divine, which explains the deep fundamental questions of existence and teaches men how to live, and how to die and for what to die. The understanding which manifests in emotions, attitudes, beliefs, rituals, duties, honour and reverence to that which is understood as Supreme Reality.”

Religion is a strong ideology and conviction which may seem difficult to resist once conceived. It encompasses the totality of human person and explains the deep fundamental questions bordering on reality, essence and existence. Man in religion tries to reach out beyond self to God or whatever is considered supreme, the wholly other. It is equally a social phenomenon. No definition of religion will be adequate if it fails to consider its God-ward and man-ward relationship. Man has a duty or role towards God and towards his fellow man.

Tylor (1963), explained religion as belief in the soul and spiritual beings. That means belief in religion is more than one being; it is belief in more spiritual beings. That is, anything one chooses to revere that has a spiritual end is called a spiritual being. Religion is referred to as a system of symbols that relate to the world, human relations, and ourselves. It is the way humans revere and relate to supernatural beings through symbols or objects. Religion is absolute dependence on supernatural beings.

On herdsmen, Alexander, and Ugwu (2024), referred to them as the nomadic people or pastoral farmers. It commonly refers to cattle raisers, who move their animals from place to place in search of pasture or green grass for their livestock to feed on. In other words, herdsmen are referred to as pastoral; Fulani are nomadic or semi-nomadic, whose primary duty is raising livestock. Herdsmen are known as Fulani herders, who usually move their livestock around for open grazing in many parts of Nigeria. Those whose primary assignment is to care for livestock.

2. Theoretical Framework

The theories that framed this research are that of frustration-aggression theory of Dollard, Doob, Miler, Mowrer, and Sears, propounded in 1939 and conflict theory of Karl Marx in 1841.

The frustration-aggression theory best describes the menace of Fulani herdsmen in Nigeria. This theory which was also known as frustration-aggression-displacement theory was developed by John Dollard and his associates in 1939. Elson (2018), described the theory as frustration-aggression hypothesis. The theory was expanded and modified by Yate in 1962 and Berkowitz in 1963, which draws mainly from psychological basis of motivation and behaviour (Ogege, 2015).

The theoretical framework explains the violent behavioural pertain which is caused by the inability of individuals to fulfill human needs. According to the theorists, the main cause of human capacity for violence is frustration aggression mechanism. This means unfulfilled expectations create relative deprivation gap between expectation and capabilities and can lead to violence or conflict. In other words, when someone or group of people have the perception of their ability or right to something (goal), if prevented from attaining such goals the result is frustration which will in turn generate aggressive behaviour that will snowball to violence (Ojo, 2014). Citing Dollard et al. (1939), Arie (2023, p. 446) noted that, “frustration produces instigation to aggression.”

The theory ranks among the most seminal and prominent theories in research on aggression. It is relevant for this research because, the herdsmen and host communities, when frustrated, will eventually lead to aggression, and aggression will result in herders attacking the host communities due to the destruction of lives and properties, including places of worship by herders. Their major targets in this case is usually, the religious centers and the worshippers. Frustration from the villagers will lead to aggression and these will result in attacks and killings, destruction of lives and property, places of worship and displacement of people. The Fulani herders usually feel frustrated when encroachment of grazing fields or tracks by the people occurs, in other words, by banning them from having access to water for their cattle, stealing their cattle or sheep, or poisoning the grass for cattle, leading to the loss of livestock, lead to frustration. The above-mentioned issues often cause frustration and aggression, which nurture violence either by Fulani herdsmen or the communities in retaliation or attacks. This is usually the case in Apa Local Government Area of Benue State.

3. Herdsmen in Biblical Perspectives

The history of herdsmen has been around for a long time; even in the Bible days, both in the Old and New Testaments, herders and farmers' conflicts existed. Ugwu and Eze (2024), observed that Abraham was a nomadic herder, who majored in livestock farming, and his children after him. In addition, Matthews (1956), said that, "originally, the Hebrew people were known as nomads in the Old Testament, the first occupation of the Israelites, before gradually embracing "agriculture, a commercial economy, and a national political system."

Joseph brothers in Egypt were known as shepherds by tradition; wandering Aramean was my father. The deliverance of the Israelites portrays them as nomads as they left with all their flocks and their families towards the Promised Land of Canaan. They camped in Sinai, and their flocks move around the surrounding environment. Genesis 13:2, 26:13, noted that, Esau and his brother Jacob were herders. Jacob selected from his flocks 550 as a gift to appease his brother Esau (Ugwu and Eze, 2024).

Herdsmen played a significant role in the Old Testament, representing a common occupation in ancient Israel and the wider Near Eastern region. Shepherding is one of the earliest professions mentioned in the Bible, and many key figures were depicted as herdsmen.

In the New Testament, herdsmen activities were equally spelt out beginning from the time of Jesus. The shepherds at the time of Jesus' birth were watching their flocks at night when the angel of God appeared and brought the good news of the Messiah's birth to them (Luke 2:8-16). The shepherd delivered the message of the angels regarding Jesus to people, and everybody was amazed.

The shepherds in the New Testament did not pose threats or challenges; rather, they were very peaceful and conveyed an angelic message about the Messiah to men. Furthermore, in 1 Peter 5:2-4, the Apostle exhorts the leaders of the church to be like shepherds caring for God's flock: "Be shepherds of God's flock that is under your care, watching over them-not because you must, but because you are willing, as God wants you to be" (Matthew 9:36). Jesus is moved with compassion for the crowds because they are "harassed and helpless, like sheep without a shepherd." This reflects the need for godly leadership and guidance.

Hebrews 13:20, Jesus is described as "the great shepherd of the sheep," underscoring His role in leading and protecting His followers. In New

Testament teaching, the figure of a shepherd (or herdsman) is a rich metaphor for spiritual care, guidance, and sacrifice, often used to describe Christ's relationship with believers and the responsibilities of a Christian leader.

4. History of Farmer/Herdsmen Conflicts in the Bible

It is clear in the Bible that farming is a business that is opened to natural and human attacks. Natural attacks include the growing of thorns, draught, flood, flood and earthquakes. It should be noted that fanning conflict is one of the first conflicts recorded in the Bible. It was the conflict between Cain and Abel (Mbachirin, 2005). God asked the two first brothers to present the products of their farming. The products of Abel met the requirements for the offering and were accepted. Cain's presentation did not meet the requirements and was rejected. Abel, the innocent fanner and probably the weaker one suffered more. This was conflict between a herder and crop farmer. It can also be seen that in most of the farming conflicts in the Bible it was the innocent party that suffered or was disadvantaged. Some of the other conflicts include the problem between Abraham and Lot, a dependent on Abraham chose the best land and the conflict with Isaac and the Canaanites. Anytime Isaac dug water wells to feed his cattle they covered them. Jacob experienced farm conflict with his father-in-law, Laban. In the book of Judges Israel experienced farming conflict as God sent other nations either to destroy or confiscate their crops, take over their farmlands and thresholds. There were conflicts between herdsmen and herdsmen struggling for water. Another major conflict was the one between Ahab and Nabot. Farming conflicts in the Bible are endless (Mbachirin, 2005).

5. Factors enabling Herdsmen Attacks in Apa

The concept of herdsmen attacks generally revolves around confrontation and violent conflicts between herders and farmers, typically in rural areas where competition over land and resources has intensified. These conflicts often arise when pastoralists, typically in search of grazing land for their cattle, encroach upon farming lands, leading to disputes over land rights, resource control, and economic survival. In recent years, these attacks have evolved in frequency and intensity, affecting not only local communities but also the broader social, economic, and security landscapes, especially in Nigeria and parts of Sub-Saharan Africa. Some of the reasons for herdsmen attacks are described below.

One of the major reasons for conflict between herdsmen and communities, is the issue of resource competition. Herdsmen attacks are often linked to

competition over land and water resources. With increasing population growth and desertification, there is a scarcity of these resources, leading to tension and conflict between herders and settled agricultural communities (Azeez, 2022).

O. Anya (personal communication, 11th September, 2024), observed that herdsmen often seek out an area with good grass, streams, and rivers for their animals, and Apa Local Government, has those resources at her disposal. The competition over fertile lands covered with grass and rivers, farmer fertile and water environment for agriculture to produce crops, and herdsmen need it to feed their livestock. This desperate desire to take control generates conflict between host communities and herdsmen.

Another challenge centers on ethnic religious dimension. Many Fulani herdsmen attacks are also rooted in ethno-religious differences, where herdsmen and the host communities often belong to different ethnic and religious groups, exacerbating conflicts and leading to broader regional instability (Bello & Musa, 2023). Most herdsmen are Muslims. The Fulani herdsmen often embark on a mission to Islamize Benue Valley in the guise of pastoralists. They usually, unleash killing, and maiming of their victims with the intention of wiping out Christian communities in the Plateau and Benue environments. This is the case in Apa today as villagers are attacked on a daily basis.

6. Herdsmen Attacks and its Impacts on Religious activities in Apa

According to Aliyu (2023), “the impacts of herdsmen attacks on religious activities have become a worrisome concern in Nigeria, where violence always causes disruptions not only to physical safety but also to the spiritual and communal life of the affected populations.” Religious leaders and members are the ones majorly at risk of fear, attacks, injury, loss of property, and displacement, which, in turn, weakens their capacity to engage in regular worship, outreach, and pastoral care, visitation, community development, and free medical care among others. The effects of herdsmen attacks on religious worship as they affect members and religious leaders are numerous.

Among the major impacts of herdsmen attack is the psychological and emotional trauma it brings about on the religious communities. Facing herdsmen attacks frequently have resulted in the experience of trauma, affecting mental health and morale of the people of Apa. Religious members and leaders who survive such incidents most often develop anxiety and depression, impacting their ability to lead and

participate in faith-based activities (A. Edo, personal communication, 16th September, 2024).

Displacement and closure of worship centers occur due to the repeated threats and attacks. Many congregations have been forced to flee or abandon their churches. The interruption of religious activities is a major consequence of herdsmen attacks. Regular services, ceremonies, and gatherings are often suspended or canceled due to fears of violence. This disrupts the communal and spiritual life that is central to many religious communities (Ojo, A. K., & Bamidele, F. A., 2021). J. Oloche (personal communication, 11th September, 2024), agreed that, in the affected areas, all religious activities are always paralyzed, and churches and other worship places destroyed or totally abandoned.

This displacement weakens community ties and disrupts continuity in worship and church functions. The loss of church buildings due to herdsmen attacks has led to a decrease in active membership and service attendance in certain regions of Nigeria (Ogundele & Adamu, 2022). As it is to today, E. Glory & E. Amodu (personal communication, 16th September, 2024) said, “many villages in Apa Local Government, such as Ugbobi, Ochemukwu, Ijaha, and among others, have been deserted due to herdsmen attacks in the affected areas.”

Fulani herdsmen attacks have economic impacts on the religious groups in Apa Local Government. Economic hardships on religious institutions caused by herdsmen attacks, also impose financial strains on religious communities, as properties, equipment, and resources are often destroyed or stolen. When this happens the religious groups are often tasked with fund raising activities to rebuild and support displaced members. Churches in the affected areas always struggle to meet financial obligations, which impacts their ability to assist vulnerable members and engage in community outreach (Kalu, 2022). The impacts of herdsmen attacks have been grievous on the people of Benue and Apa in particular, as means of livelihood destroyed, farmlands and crops abandoned, houses and economic trees and livestock destroyed, and human beings displaced and exposed to hunger (G. Simon, personal communication, 13th September, 2024).

Another challenge is seen in the area of restricting outreaches and evangelism. Fear generated by Fulani herdsmen attacks has a chilling effect on religious outreach. Many church leaders now hesitate to conduct outdoor evangelism or visit remote congregations, as these regions are considered high-risk. Okeke & Musa (2023), noted that “this restriction has diminished the effectiveness of evangelical missions and community services. I. Agada & O. Ben (personal communication, 13th

September, 2024), expressed their dissatisfactions, “that almost every Christian activity was brought to a hot, prayer meeting, vigil, Bible study, and even Sunday service could no longer hold as people vacate their villages and run for their lives.”

These frequent attacks have continued to weaken the religious intuitions’ social influence. Okafor, & Ekwe, (2022), opined that the reduction in regular attendance and participation can weaken the influence of religious institutions, impacting their ability to promote social cohesion, provide community support, and participate in charitable activities.

7. The Position of the Church towards Resolving Herdsmen/Farmers Clashes

Okeke (2023), addressing the church’s position on resolving herdsmen attacks, noted that, “it is very essential to analyze the roles religious institutions play in conflict resolution, peace building, and fostering dialogue in affected communities. Recent literature offer insights on how churches, through both spiritual and practical approaches, can encourage peace and reconciliation. Here are some roles the church should play towards resolving herdsmen and host communities’ clashes:

The Church as a mediator in conflict resolution, should often act as neutral party in conflicts. Thus, bringing together communities through organized peace meetings and fostering dialogue. Churches can help mediate by providing a space where different groups can share grievances and work towards compromise. Okeke & Musa (2023), discussed the Catholic Church’s role in organizing interfaith dialogues between Christians and Muslims in conflict zones, which has helped reduce tensions.

The promotion of nonviolence and peace education advocacy is very key in the discussion under consideration. The church’s moral authority and commitment to peace encourage communities to reject violence as a solution. Many churches engage in peace education, particularly targeting young people, to foster a culture of nonviolence. Adamu & Nwosu (2022), examined how Methodist churches in Nigeria provided peace education programs that discouraged violence, thereby reducing retaliatory attacks in Apa.

Advocacy for Government and policy interventions is very important in resolving this menace of attacks on religious communities. On this, Musa & Oladele (2021), highlighted how the Christian Association of Nigeria (CAN) advocated for better security policies to protect affected communities. Churches also use their influence to advocate for policy changes that address the root causes of herdsmen conflicts, such

as resource allocation, land rights, and security. Religious leaders often pressure the government to enhance security and implement fair resource-sharing practices.

Encouraging support for displaced and affected persons will foster an end to the incessant attacks. In this regard, Eze (2023), discussed how the Anglican Church in Benue State provided ongoing support to families displaced by herdsmen attacks. Churches play significant role in offering relief services and supporting displaced individuals and families impacted by herdsmen attacks, often providing shelter, food, and spiritual support. Also in 2017, R. Ogwola (personal communication, 15th September, 2024), said the Methodist Church Nigeria, under the leadership of Chukwuemeka Kanu and Oliver Ali Aba, provided food and relief material to victims of herdsmen attacks at government house Makurdi. Even recently, the Methodist Archdiocese of Benue donated relief materials to support Apa and Agatu over herdsmen attacks.

Reconciliation and forgiveness are key catalysts towards ameliorating the challenges of herdsmen attacks in Apa. Johnson & Adekunle (2022), evaluated the importance of reconciliation programs by the Presbyterian Church in northern Nigeria, emphasizing forgiveness and reconciliation. Churches promote reconciliation through teaching forgiveness and supporting initiatives that allow conflicting parties to rebuild relationships. This spiritual encouragement can help communities heal from the trauma of violence.

In addition to the aforementioned, prayer is key to ending the recurrent herdsmen attacks because with God all things are possible. The book of 2 Chronicles 7:14. “If my people who are called by name humble and seek my face, repent, and turn away from their evil ways, I will hear and forgive and heal their land.” The church should embark on prayer and seek God’s intervention in the face of herdsmen attacks.

Information gathering and security alert will go a long way in nipping this menace in the bud. Leaders and members of the church should take information gathering seriously. Be attentive, vigilant, and watchful, and report strange movements or information to security personnel. Christian youths should be advised not to confront herdsmen without government security forces; due process should be followed to maintain law and order in the society. Herdsmen also should avoid the use of dangerous weapons and aggressive confrontation against host communities.

8. Conclusions

The activities of herdsmen attacks on religious institutions and places of worship in Apa Local

Government Area have become issues of great concern and worry. They occur on a daily basis, leading to wanton destruction of farm crops, pollution of stream waters, killing, maiming, destruction of properties, church buildings, raping, robbery, kidnapping, and displacement of villagers. The struggle over land and water and the attempt to Islamize Benue State, mostly populated by Christians, form the brain behind the Fulani herdsmen attacks. The impact of these attacks has led to the burning and closure of many churches, in Apa, Benue State, and many parts of Nigeria, leading to paralyzing religious activities. The Church should continue to mediate and preach tolerance among herdsmen, communities, and adherents of different religions. The culture of peace, love, and tolerance for peaceful coexistence in our society should be appropriated by all. And those herdsmen who carry dangerous weapons should be arrested to face the wrath of law of the land.

9. Recommendations

That security measures from within the state, and local communities be put in place in order to checkmate the activities of Fulani herdsmen attacks on places of worship such as churches and mosques. Police and soldiers should always guard religious institutions.

Fulani herdsmen carrying firearms and dangerous weapons should be arrested and prosecuted by the law enforcement agents. The religious institutions should continue to preach peace, tolerance, and love to herdsmen, farmers, hosting communities, and youths to show violence. Finally, the Church should always take part in the mediation processes and progress to strive in the society like Apa, Benue, and Nigeria at large.

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Designing and Prototyping of a Smart Home System Base on IoT integration

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Abstract. The increasing complexity of modern home environments often leads to energy management, security, and convenience challenges. Traditional home automation systems are typically limited in functionality, requiring manual intervention and offering minimal integration with other devices. This fragmentation results in inefficiencies and a need for more user control. To address these issues, the Internet of Things (IoT) offers a comprehensive solution by enabling seamless connectivity between devices and providing real-time data management. An IoT-based home automation system integrates various household devices—lighting, security cameras, and HVAC systems—into a unified platform. This system allows users to remotely monitor and control their home environments through a centralized application, ensuring improved energy efficiency, enhanced security, and greater convenience. Implementing an IoT home automation system is intended to create a smart living space that adapts to user preferences, optimizes resource usage, and provides peace of mind through enhanced safety features. Ultimately, this solution simplifies daily tasks and contributes to a more sustainable and intelligent home ecosystem.

1. Introduction

New ideas and technology are desperately needed in today's modern environment to make daily tasks simpler. A special system called home automation can manage and communicate with almost every component of the house (Al-Gburi & Abdul-Rahaim, 2022). The coordination of all domestic amenities and appliances is referred to as "home automation." The majority of used microcontrollers have the ability to manage household electrical appliances, however it is crucial that the various electrical appliances are connected to one another in order to establish communication with (Abdulraheem et al., 2020).

Home automation systems are becoming increasingly necessary in daily life because to their many benefits, including comfort, convenience, centralized control of appliances, cost savings, energy efficiency, security, and safety. Users' quality of life is increased with a home automation system (Ali et al., 2020). The internet of things (IoT), a technology that allows connections between devices over the Internet, is more important in this work than the Wi-Fi-enabled gadgets that can be utilized to provide home automation. (Pujaria et al., 2020).

Wireless fidelity (Wi-Fi) is a wireless technology that transmits data across the air using radio frequency. Wi-Fi's initial speed ranges from 1 to 2 Mbps. In the 2.4 GHz frequency spectrum, Wi-Fi sends data. It uses frequency division multiplexing technology in its implementation. Wi-Fi technology has a range of 40 to 300 feet (Al-Gburi & Abdul-Rahaim, 2022).

IoT is a concept in which every device is given an IP address, and anyone may identify that device on the internet by using its IP address. The ability for different devices to connect with one another has been made possible by recent technological advancements that allow the usage of wireless controlling environments like Bluetooth and Wi-Fi (Stolojescu-Crisan et al., 2021).

The development of wireless technology has led to the emergence of a variety of connections, each with its own distinct characteristics and uses. The Wi-Fi connection is one of the most popular ones that is frequently used in Home Automation System (HASs). In this research, Wi-Fi has more than adequate capabilities. Additionally, the cost of the system will be reduced because the majority of electrical gadgets and equipment already have a built-in Wi-Fi adapter (Kadali et al., 2020).

An ESP32 DEV KIT V1 micro controller is used in this research to control the system. The research also

use of the Arduino IoT cloud infrastructure, from which a variety of linked devices may communicate real-time data with one another and be seen anywhere using a straightforward user interface (Kadali et al., 2020).

To control lights, fans, and other electrical appliances, we will connect an 8-channel relay module to an ESP32 Wi-Fi module and send ON/OFF commands from the dashboard of a computer or a mobile device using the Arduino IoT cloud platform.

2. Materials and Methods

Design methodology of this system has two major parts, the software and hardware design. The hardware is designed by arranging smart phone, micro-controller ESP32 DEV KIT V1, Power supply, 8- channel relays and transistors, whereas software design includes the Arduino IoT cloud software app, and the program or source code that is written and uploaded in the microcontroller. The appliances are controlled using relays via Wi-Fi. The activation of the home appliances is achieved by using the remote-control app. on the smart phone. The figure below shows the block diagram of android application using Wi-Fi and ESP32 microcontroller for home automation via the Arduino IoT cloud platform

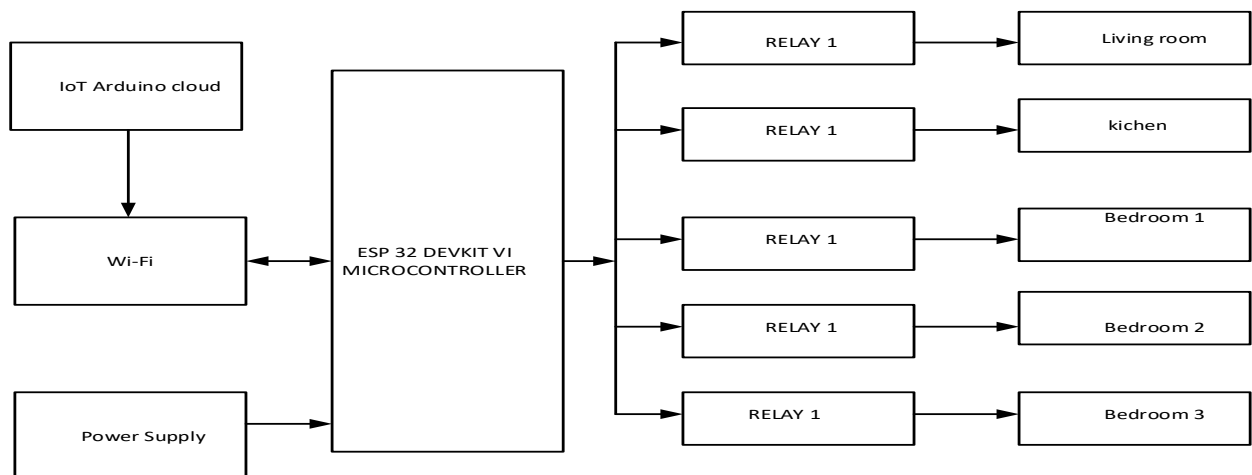


Figure 1: Block diagram of the IoT infrastructure design.

2.1 Power Supply Section

The input voltage (V_{in}) range of the ESP32 DEV KIT V1 ranges between 7v-12v dc, a regulated voltage of 5v is supplied to the micro-controller, leaving the ESP32 to draw whatever current it needs. An external power supply was incorporated into the system in order to supply a regulated voltage to the micro-controller. Regulated The power supply section can also be coupled together as seen in figure 2 using components which include a transformer, bridge rectifier, a capacitor, a LED and LM7805 IC voltage regulator to give a regulated 5v dc output.

Since the input voltage range of the chosen regulator LM7805 is 7V- 35V, the minimum input voltage required to construct a 5V DC power supply circuit that can deliver a maximum load output current of 500mA is 7V. Thus, in order to scale down the main AC to at least this voltage, a transformer is required.

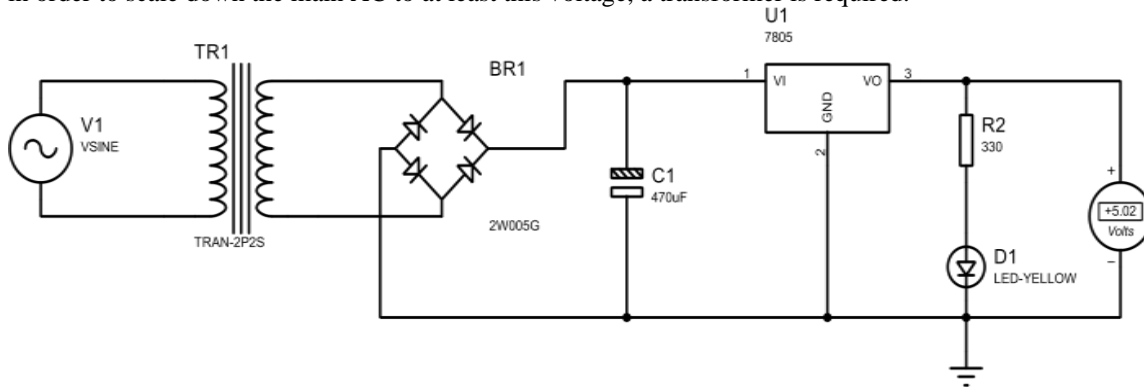


Figure 2: A 5V DC-power supply design

2.1.1 Esp32 Dev Kit V1

The ESP32 DEV KIT V1 is the main processing unit in the development of this project as it creates interaction between the software (written program) and the hardware components of the project. Data acquisition and Data processing are some of the stages involved during processing, in home automation system.

The research covers mainly the scope of actuation, as sensors are not used in the project development. Once the ESP32 is connected to the actuators, it can begin to control them based on the results of the data processing stage. For example, if the ESP32 has determined that the lights need to be turned on, it will send a command to the relay that controls the lights.

The operating voltage is 3.3V, but a 5V output is taken from the GPIO pins to the relays through the transistors in order to work effectively.

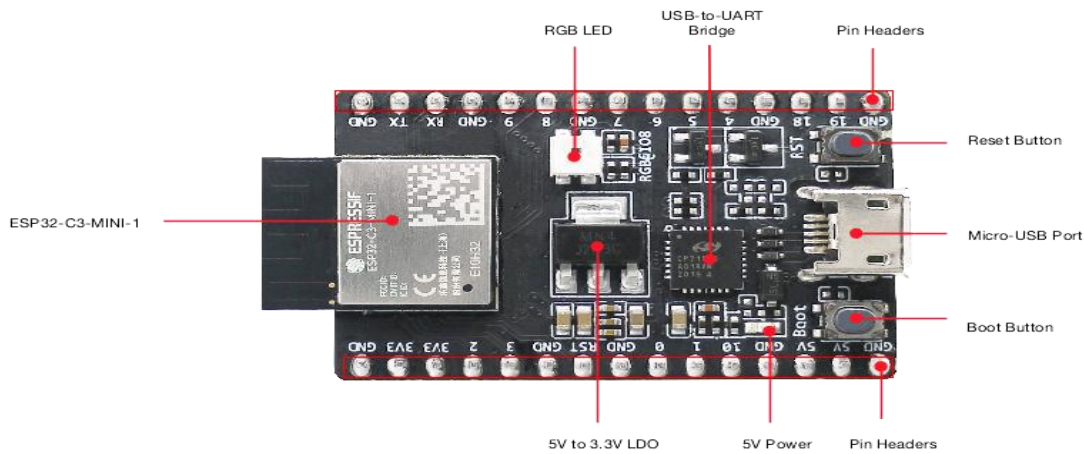


Figure 3: ESP32 micro-controller

2.1.2 8-Channel Relay Module

The output unit is an 8-Channel relay module that is connected and controlled by the ESP32 DEV KIT V1, and allows the load voltage to be controlled. These relays receive output signals directly from the ESP32 and energizes the coil. The load voltage connected to the relay contacts which consists of NO, NC and Common Terminal are now being controlled. The home appliances like fan, socket and bulbs can now be controlled by the relay from the ESP32 DEV KIT V1.

The ESP32 DEV KIT needs a 3.3V basically to operate, but the 8-channel relay module need a input voltage of 5V to operate. So,with the aid of the bc547 transistor the weak signals generated by the microcontroller is being amplified.

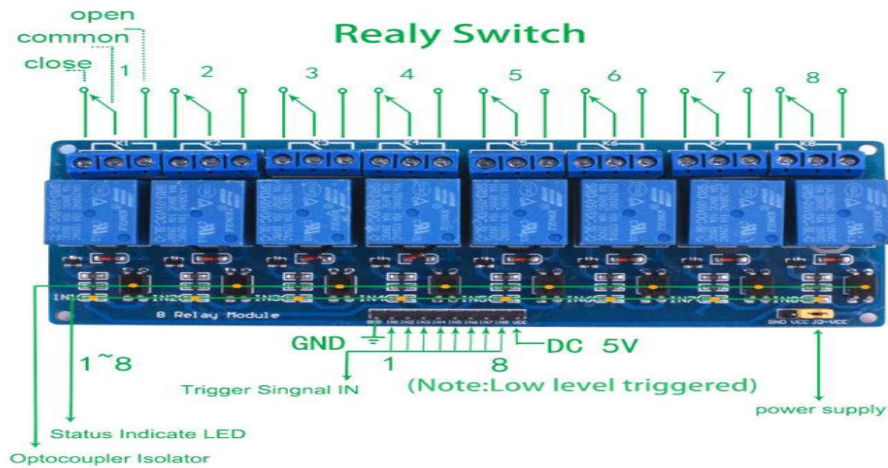


Figure 4: An 8-Channel Relay Module

2.1.3 Transistors (BC547 NPN)

Transistors operate as electronic switches in IoT home automation systems, making them critical components. They enable the microcontroller (ESP32) and others like Arduino, ESP8266 which are lowpower microcontroller to control and manage higher-power devices like relays, motors and lights. The microcontroller generates a low-power signal (usually 3.3V or 5V), but in this case 5V to control the transistor. Then this signal is applied to the base pin of the transistor. When a small current flow into the base pin, it allows a much larger current to flow between the collector and emitter pins. This amplification allows the lower-power signal from the micro-controller to control the power required by the connected device.

The amplified current flowing through the collector and emitter pins can then activate the relay and the other devices connected to it and this allows the microcontroller to turn the devices ON/OFF remotely based on the user input. They amplify current from base to the emitter. Ultimately, DC bias is essential for making sure the transistor works smoothly and amplifies signals correctly. The fixed bias approach was used, as a resistor was used to get a fixed current at the base and emitter terminal.

value of resistor used for biasing = $1k\Omega$;

To find the Base current of the transistor:

$$\text{Base Current}(i_b) = \frac{V_{cc}-V_{be}}{R_b} \quad (1)$$

Parameters given:

$$V_{cc} = 5v ; V_{be} = 0.6v ; R_b = 1k\Omega$$

$$\text{Base Current}(i_b) = \frac{5 - 0.6}{1000} = 4.4mA$$

Collector current;

$$i_c = \beta \times i_b \quad (2)$$

β for npn BC547 = 310 as depicted in the figure below using a multimeter.

$$i_c = 310 \times 4.4mA = 1.364 A$$

Once the relay is active then the current is $\sim 70mA$ which is still less than the collector current. Quiescent current (the amount of current it uses when not actively working) is 2mA. The maximum current is 10A.

Now to calculate the current, power and voltage gain of the transistor;

$$\text{Voltage Gain}(A_v) = \frac{\Delta V_c}{\Delta V_b} = \frac{4.56v}{0.6} = 7.6$$

$$\text{Current gain}(A_i) = \frac{\Delta i_c}{\Delta i_b} = \frac{1.364}{4.4 \times 10^{-3}} = 310$$

$$\text{Power Gain}(A_p) = A_v \times A_i = 310 \times 7.6 = 2,356 = 2.36 kw$$



Figure 5: transistor measurement (a) the h_{fe} measurement and the (b) collector current measurement

2.1.4 Arduino Web Editor

The software part of this system consists the written C++ programming language that actually defines the operations of each button on the Smartphone “Arduino Remote Control” application. This program is written using the Arduino Web Editor. The Arduino Web Based Editor is a cloud-based application that is supported by any operating system with a web browser.

Writing and uploading programs to Arduino-compatible boards, like the microcontroller ESP32 DEV KIT V1, is done with this tool. The Arduino Web Based Editor is a cloud-based application that is supported by any operating system with a web browser. Writing and uploading programs to Arduino-compatible boards, like the microcontroller ESP32 DEV KIT V1, is done with this tool. The microcontroller receives data from the Smartphone using the *IoT Remote control* application available on goggle play store, and processes the data sent with already written and uploaded program. Although using the main Arduino IDE provides a more powerful and feature-rich platform than the Arduino web editor, the Arduino web editor is a good option for beginners and users who needs a simple and easy-to-use platform.

2.1.5 Arduino IoT Cloud Remote Application

The Arduino IoT remote application is the mobile software that is used to control and also monitor all of our connected appliances. This IoT remote app by Arduino Cloud allows for monitoring in real-time the IoT devices from anywhere at any time. The IoT remote application (App) receives the compiled code from the Arduino web editor and in turn is able to trigger the relay that controls a specific home appliance via the microcontroller.

3. Results and Discussions

This study investigated the performance of an IoT home automation system in residential settings and at various locations. The results showed that the system was able to achieve significant energy savings and improve user comfort.

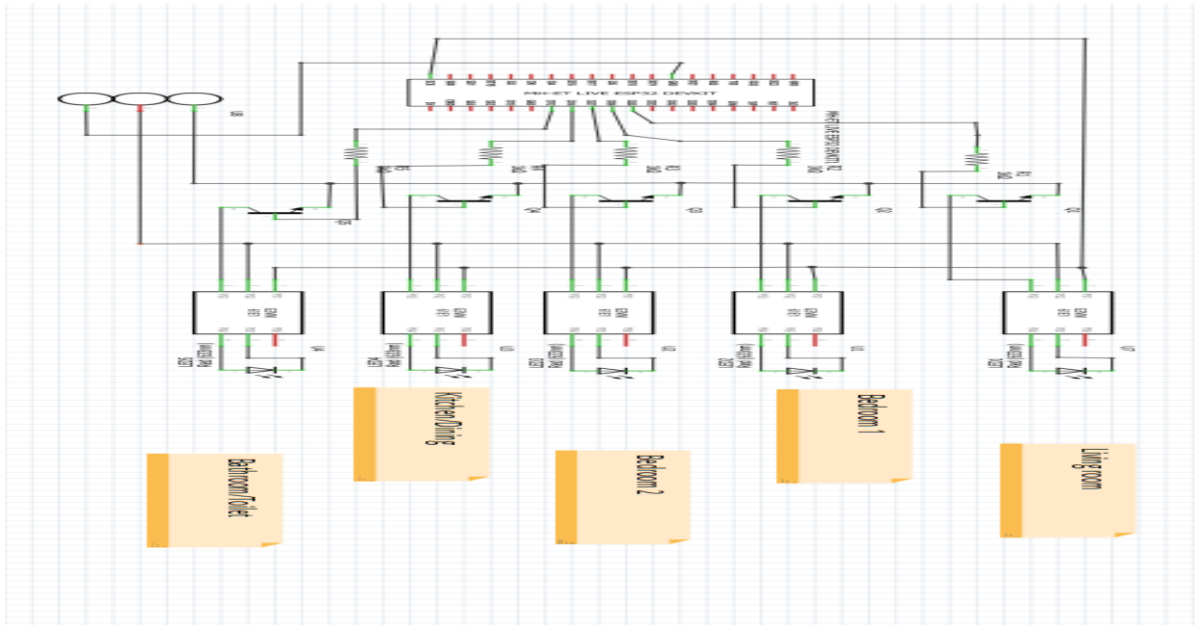


Figure 6: Circuit diagram of the system

3.1 Component Testing-Hardware

The hardware testing is presented in Figures 7 and 8 below. Once all of the schematic design and analysis is completed, the system is realized physically. The designed system was eventually built after being put into use and tested to make sure it functioned as intended to meet desired specifications. The process of testing and implementation involved the use of basically a digital multimeter.

Continuity testing was carried out between the various components of the system and at various points, such as between the relays, ESP32 DEV kit V1, the N-P-N transistors (BC-547) and the 5V dc supply, using a digital multimeter to ensure proper connections exist between them. A test was also carried out on the ESP32 DEV KIT V1 microcontroller, which enables one to clarify the signal output voltage whenever an input signal is sent from the smartphone application, which is already connected to the ESP32 via Hot-Spot.

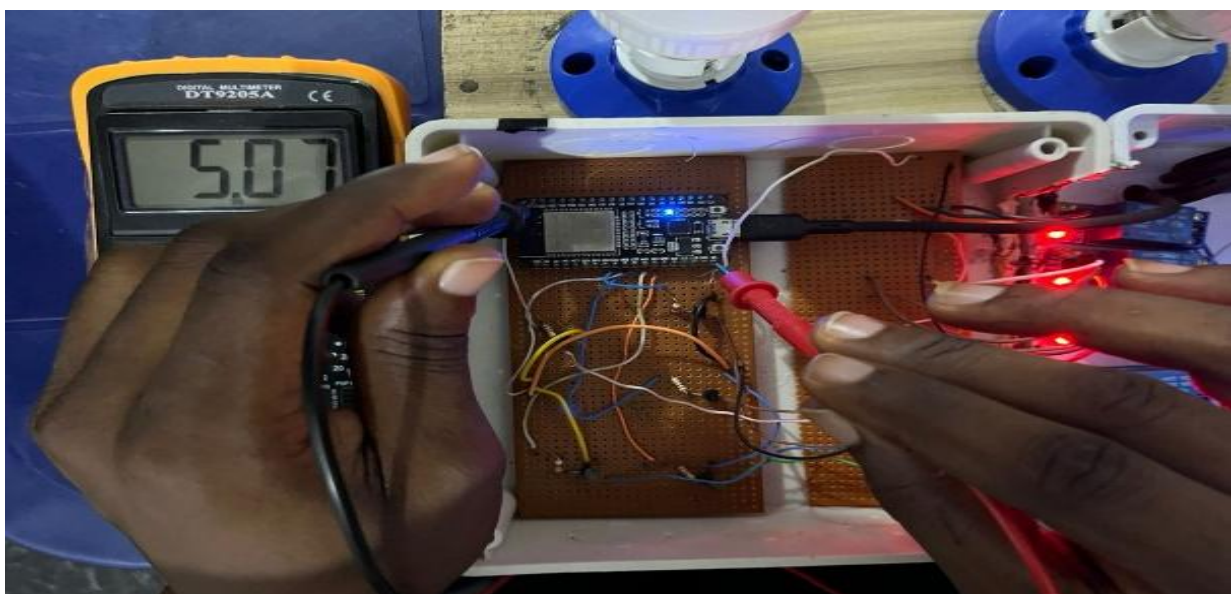


Figure 7: ESP32 voltage test

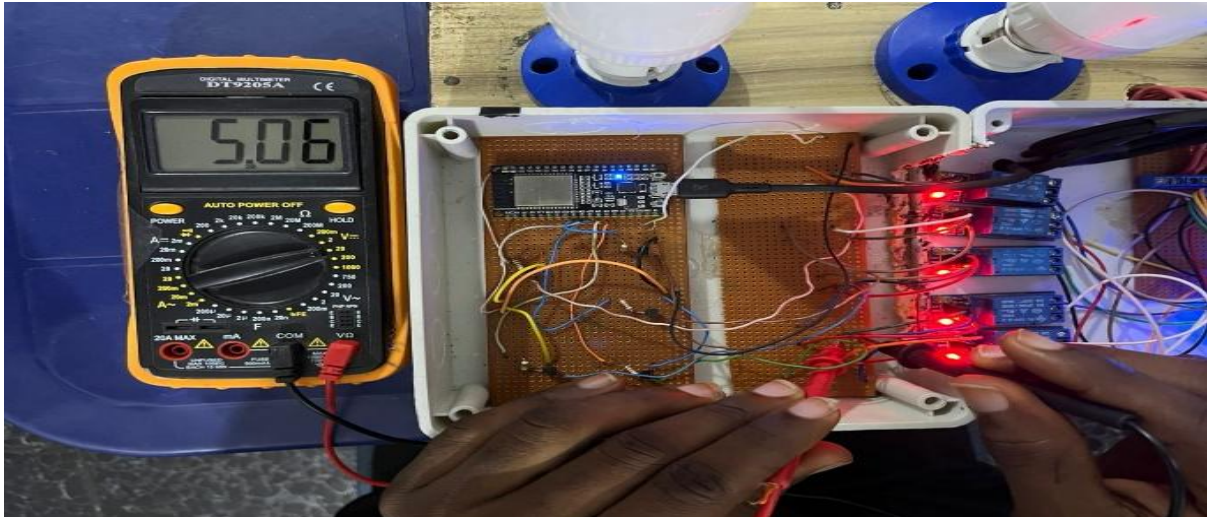


Figure 8: Relay voltage test

3.2 Component Testing-Software Testing

The software components of the produced system were tested to guarantee an effective integration after the hardware components had been successfully tested to determine correctness and system workability. In order to send commands to the web for desirable actions, the commands can be entered from the IoT remote app on any mobile device, provided that the hotspot connectivity is secured with the ESP32 kit and the corresponding results are achieved at any location.

The system's workability and its integration with the software were also tested at different landmarks and reference points. The Google map was employed to get the landmark points (longitudes and latitudes) at different locations. The system is placed at a given (fixed) landmark position. The user then controls the home appliances by switching ON the buttons correlating to each home appliance at different landmark positions far away from the system at a given time using the IoT remote app. The required activation is then achieved. Observing at the control of one of the appliances located in bedroom two;

(BEDROOM 2): when it is pressed, it sends commands to the ESP32 via the cloud. The ESP32 will then give out +5V output for ON, the corresponding relay controlling bedroom 2 will be energized, and the bulb will be powered.

The user landmark position and the time at which the control was initiated via the IoT control app are displayed below. Also, the landmark position of the system and the bedroom 2 bulb coming up is shown below, which correlates to the time the control was initiated.

At user's end:

The user landmark position: **6°50'03.2"N 3°06'29.0"E**

Time of Control of bedroom 2 via app: 1:48pm

At system end:

System landmark position: **6°49'07.7"N 3°06'23.2"E**

Time the Bulb came UP: 1:48pm



Figure 9: Interface of IoT app controlling B/R 2 appliance

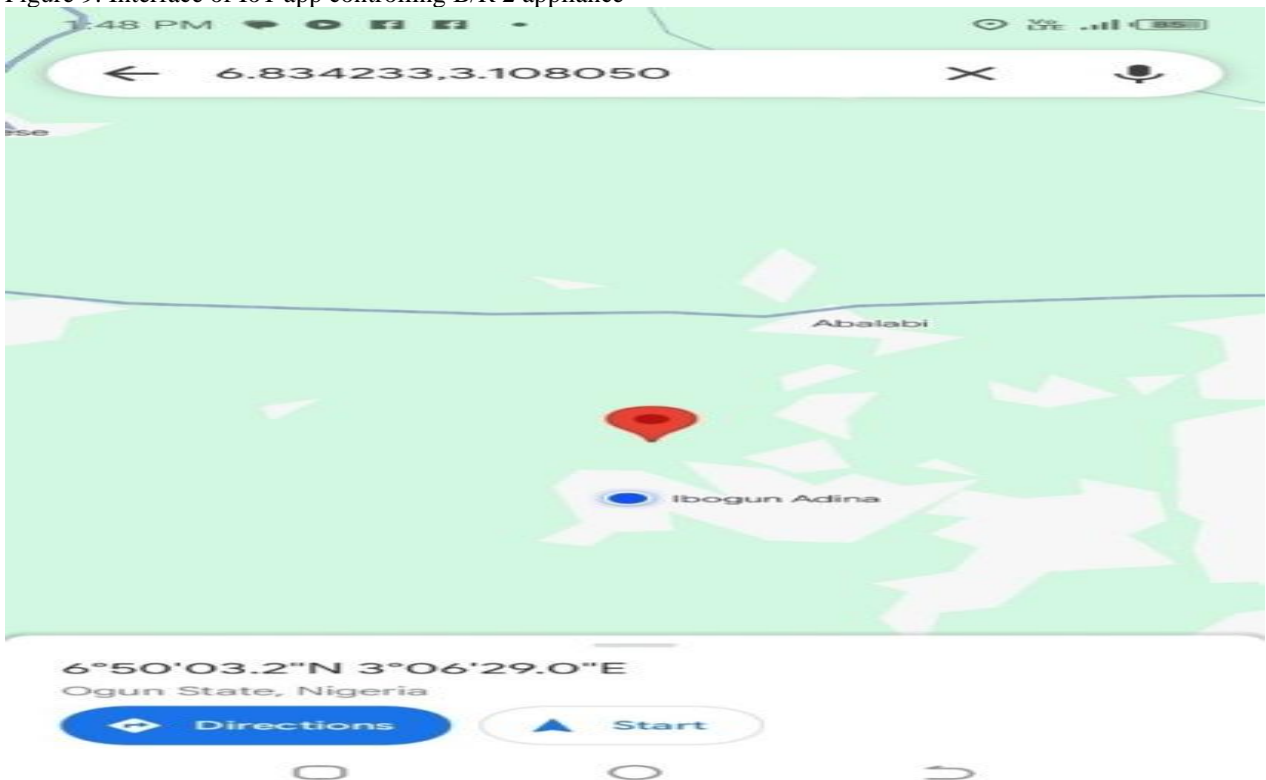


Figure 10: Landmark position of the user at time of control

3.3 The System Casing

In order to ensure that the circuits are compatible before soldering, this task has been implemented using a breadboard. Prior to beginning the process of soldering the circuit on the Vero board, a series of tests were conducted on the breadboard in accordance with the schematic specification found in figure 6 above. As seen in figures 11 and 12, the system was connected to a plastic enclosure. Because the casing is made of plastic, it was specially perforated and has vents to add a calming effect.



Figure 11: Coupled system with lights OFF, Figure 12: Coupled system with lights ON

3.4: Flow Chart of the System

The flow chart in figure 13 shows a visual representation of the process. This flowchart shows the basic steps involved in operating the IoT home automation system. After the system is turned on and connection is established between the device and the system via hotspot, the user launches the IoT remote control app. It then checks for user input, after which the input is then sent over the cloud for processing, and the appliances is in turn activated in response to the user input.

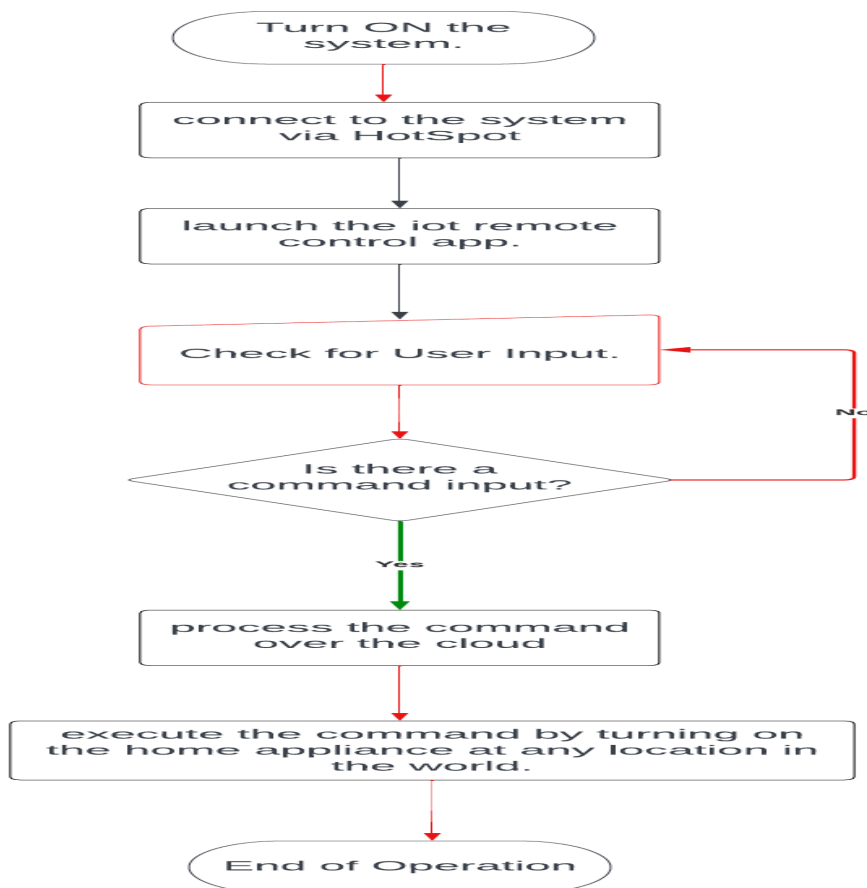


Figure 13: Flow chart showing sequence of operation

4. Conclusion

IoT-based smart home automation systems provide a wealth of advantages and opportunities. These systems allow for the intelligent control, monitoring, and automation of many aspects of a home environment, including security, energy management, and convenience, by linking devices, sensors, and actuators.

The step-by-step instructions for the smart home automation unit have been included in this work. Home appliances can be transformed into smart and intelligent IoT devices with the aid of the specified system. Real-time monitoring of home appliances and their conditions is made possible by the developed Smart Home Automation system, which is simple to install in a home. Using the IoT remote application, controlling household appliances is simple and effective. The user interface functions well and is simple to use on all Android mobile phones. It does not require an internet connection, except the login details, which are required for the first users.

The system has two advantages. First, using the cloud connectivity, we can monitor and access our smart home easily from anywhere, which facilitates energy efficiency.

Second, it aids the elderly and people with disabilities. Other actuators and sensors can be added to the system. It is also possible to enhance the developed system to make it ready for eventual commercialization. All things considered, IoT-based smart home automation systems have the power to make our homes more intelligent, comfortable, and efficient.

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Indigenous Design Aesthetics, Cultural and Gendered Preferences as Catalyst to Navigating Market Dynamics

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Abstract. The Nigerian textile industry has experienced a severe decline, with the collapse of 150 companies in 2023, leaving only two operational firms, both foreign-owned. This downturn is primarily attributed to the rampant influx of textiles, particularly from China, which has saturated the market and undermined local manufacturers' and designers' competitiveness. This paper examines the interplay between textile design aesthetics, consumer preference and the socio-cultural dimensions of gender within the Nigerian context. Data is collected from a survey involving 23 Nigerian respondents who patronize imported textiles. The findings highlight the cultural significance of indigenous textile patterns, deeply embedded in the identities and traditions of various ethnic groups, underscoring the need for local designers and producers to innovate and align with consumer preferences. The paper also discusses the economic implications of the failing local textile industry, including job losses and capital flight and offers strategic recommendations for local manufacturers. Ultimately, this study emphasizes the importance of integrating traditional design aesthetics with contemporary trends to foster a sustainable and competitive textile sector in Nigeria.

Keywords: Textile design, gender construction, Nigeria, cultural aesthetics, motif, pattern

1. Introduction

The Nigerian textile industry has witnessed a significant downturn, marked by the collapse of 150 textile companies as reported by Punch Newspaper in August 2023. This liquidation left only two operating local textile firms, both of which are not Nigerian-owned. The Nigerian Textile Employers Association attributes the decline to rampant smuggling of textiles into the Nigerian market. Smuggling has severely impacted the Nigerian textile sector, undermining the

competitiveness of local manufacturers (Ikpotu, 2023). The influx of illegally imported textiles, particularly from China, has saturated the market, making it challenging for local producers to thrive. This phenomenon is not unique to Nigeria; similar challenges have been observed in other developing economies where regulatory enforcement is weak and smuggling is rampant (Olumide & Daramola, 2022). The dominance of imported fabrics, especially from China, is driven by two primary factors: cost-effectiveness and design adaptability. Chinese textile manufacturers have successfully captured the Nigerian market by producing affordable fabrics that resonate with local design preferences. These manufacturers have tailored their designs to reflect indigenous Nigerian aesthetics, such as the intricate and colourful patterns of Yoruba Adire and Aso-oke, the symbolic Isiagu motif of the Igbo, and the bold zebra stripes of the Tiv (Chinweizu, 2023).

The cultural significance of Nigerian textile design, particularly within the context of some selected ethnic nationalities, is profound and multifaceted. The textiles patterns are more than just fabrics; they constitute cultural artefacts, artistic expressions and identity declarations (Lemi, 2024). They symbolise a complex and diverse tapestry of Nigerian cultures, histories and values, while also influencing and defining the international fashion scene. Labode and Braide (2022) conjecture that Africa's diverse cultural landscape portrays the ways in which these dynamics manifest the intricate relationship between textile aesthetics and the social construction of gender. By synthesizing insights from fabric design preferences, cultural influences, gender theory and art history, there is a need to examine the complex interplay between textile design aesthetics and gender identity in juxtaposition to aesthetic appeal, ethnic intersectionality influences as well as sustainability considerations in textile purchasing choices. This

paper aims to explore and analyse the fabric purchase behaviours and design preferences among Nigerian consumers, focusing on the influence of cultural elements, personal taste, and socio-economic factors. It examines the factors contributing to the decline of Nigeria's local textile industry and suggests strategic measures for local manufacturers to remain competitive by aligning with consumer design preferences and behaviour.

2. Review of theoretical Perspectives on Textile and Dress Culture

In August 2023, Punch Newspaper reported the collapse of 150 Nigerian textile companies, leaving only two foreign-owned firms operational. The Nigerian Textile Employers Association attributed this to textile smuggling. Local manufacturers must study consumer preferences and design trends to compete, as Chinese imports dominate due to cost-effectiveness and alignment with indigenous designs. Within this historical context, indigenous designs encompassing gendered symbolism has played a pivotal role, shaping the ways in which textiles are produced, worn and interpreted within Nigerian society. Roach-Higgins and Eicher (2016) assert that dress imposes identities on individuals by communicating roles within cultural and social constructs. As such, the communicative

elements of dress is exclusively embedded in the textile design and fashion style.

Psychological research on dress and textile design appeal, though lacking a unified theoretical framework, spans various domains within psychology and related fields. Johnson et al. (2014) provide a comprehensive overview of these diverse research aspects. One area examines how observers infer women's sexual interest based on their attire (Treat et al, 2016; Hester & Hehman, 2023). Another line of inquiry, rooted in evolutionary theories of sexual selection, investigates the effect of the colour red on perceived attractiveness (Lehmann et al., 2018). Research on enclotted cognition explores how clothing influences the wearer's cognition and behaviour (Crutzen & Adam, 2022; Hester & Hehman, 2023). Studies in applied professional journals often discuss how attire affects perceptions of professionalism and competence in specific settings (Furnham et al., 2013). Personality psychology investigates how accurately clothing reflects the wearer's personality, culture and how it shapes observers' impressions and culture (Stolovy, 2021). Additionally, research explores how dress influences social categorization, such as associating specific clothing items with particular social groups (Rhodes & Baron, 2019).

To contextualize the discussion, it is imperative to acknowledge the rich historical legacy of Nigerian textile traditions, which encompass a diverse array of techniques, motifs and cultural meanings. Labode and Braide (2022) highlight the intricate symbolism embedded within traditional African textiles, with patterns and designs often carrying deep cultural and spiritual significance. Beyond their aesthetic appeal, Nigerian textile designs frequently have symbolic significance and function as a type of social communication. Specific patterns, motifs and colours can provide information about the wearer's age, marital status, social standing, or even mood. These designs function as a visual language, allowing people to express themselves and communicate within their communities.

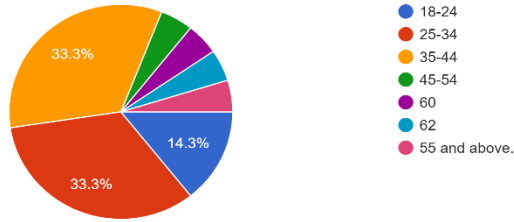
3. Methodology

Demographic Information

The survey consisted of 21 respondents, predominantly from two major ethnic groups: Yoruba (11) and Igbo (9), with one respondent from the Atyap and one from the Calabar ethnic groups. The gender distribution was 10 females and 11 males. Occupations varied, with civil servants, students, traders/business persons, and others (professionals).

Data was randomly collected via an online survey with 23 respondents answering structured and unstructured questions. The demography shows the majority of the respondents were Nigerians between the ages of 25 to 44 years of age as shown in the pie chart below. This was followed by interviews of some Nigerians, who patronize merchants dealing in imported textiles and whose preferences for textile designs for occasions are mainly native clothing.

1. Age?
21 responses



4. Presentation of Result and Findings

The study surveyed 23 Nigerian respondents to understand their fabric purchase preferences, revealing diverse tastes influenced by cultural, personal and practical factors. The frequency of fabric purchases varied, with most buying fabrics every few months. Preferences for fabric designs included abstract, stripes, geometric, floral and ethnic/traditional patterns, highlighting a strong inclination towards personal comfort and fashion trends. Colour choices are balanced between bright and muted tones, driven mainly by personal taste. Cultural elements in fabric choices were deemed important by a majority, emphasizing the cultural significance in fabric selection. Local markets and specialised shops were the primary sources for fabric purchases, while sustainability was of moderate concern. Fabric design preferences shifted based on occasion, with considerations such as suitability, durability and event nature influencing choices. Respondents' colour preferences spanned bright colours, mixed tones and muted combinations, reflecting a nuanced approach to fabric aesthetics and functionality.

5. Analysis of Findings

The research findings present a comprehensive overview of fabric purchase preferences among Nigerian respondents, showcasing an inclination to cultural and personal influences. The frequency of fabric purchases varies significantly, with some respondents purchasing monthly and others rarely, reflecting diverse consumer behaviours influenced by socio-economic factors and cultural practices (Etuk et al., 2022; Amdan & Zanna, 2021). Preferences for fabric designs such as abstract, stripes, geometric, floral, and ethnic/traditional patterns indicate a dynamic interplay between contemporary fashion trends and cultural heritage (Allen, 2024; He et al., 2022). Influences on colour preferences primarily stem from personal taste, with fashion trends also playing a significant role, suggesting an increasing

globalization of fashion preferences (Gray et al., 2014; Gazzola et al., 2020).

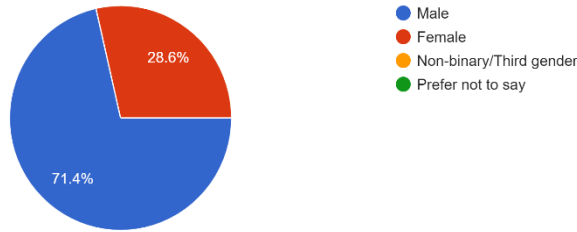
Incorporating cultural elements in fabric choices is crucial for many respondents, emphasizing the role of textiles in expressing cultural identity and heritage (Lange et al., 2022). The preference for local markets and specialized fabric shops highlights a trend towards personalized and culturally relevant shopping experiences, which support local economies (Zhang & Huang, 2024). Responses to the importance of sustainability reveal a growing, albeit uneven, awareness of environmental issues (Abbate et al., 2023). The adaptability of fabric preferences based on the occasion portrays the functional and symbolic role of textiles in non-verbal communication (Jang & Ha, 2023). Varied colour preferences, particularly the inclination towards bright colours, reflect the vibrant cultural aesthetic characteristic of Nigerian fashion, symbolizing joy and social cohesion while blending traditional and contemporary trends (Tachia-Bai & Dajo, 2024).

6. Discussion

Gendered Symbolism and Textile Aesthetics

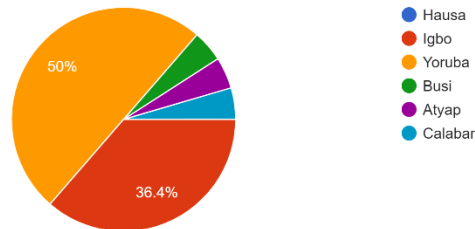
Textile designs often serve as visual markers of gender identity, with specific motifs, colours and patterns associated with masculinity as can be inferred from the response of men who constitute over 50% of the population of the survey. These male respondents also constitute the majority of importers of foreign textiles into the Nigerian apparel market. Interviews from both populations favoured the use of stripe, abstract and geometric patterns on Ankara and other fabric designs. For example, the use of geometric patterns and earth tones in men's attire may symbolize strength and authority, while the incorporation of floral motifs and vibrant hues in women's clothing may signify elegance and fertility. Through an analysis of these aesthetic conventions, we can gain insight into the ways in which gender norms are inscribed and reinforced within Nigerian textile traditions.

3. gender
21 responses



The textile traditions differ from one ethnic nationality to another. Whilst some ethnic group portray a good deal of gender disparity in the selection of fabric designs, others have both male and female genders having same taste in design selection. The Yoruba, one of the largest ethnic groups in Africa constitute the majority of respondents in this research (47.6%) show little or no disparity in the selection of fabric design used by both the male and female genders.

2. Ethnicity:
22 responses



However, what is prominent is a rich tapestry of the use of motifs, icons and sundry design elements embellishing the entire fabric. There are hardly any such things as poor distribution of motifs to create specific patterns especially when the popular Ankara fabric is evaluated in this regard. There are no restrictions with the use of motifs and background design. Design elements including lines, shapes and colours are generously used with a specific design in most fabric design preference of this demography. What may be considered a riotous use of colours in some other climes, may be pleasant and appropriate among the Yoruba, especially when it comes to textile pattern appeal. This is because the Yoruba chromatic system of colour use is culturally classified into three including funfun, pupa and dudu (Ibrahim, 2014). The funfun group of colours include white, sky blue, turquoise, silver and icy colours. The Pupa group include red, orange, yellow and gold, whilst the dudu group of colours are black, dark blue, dark greys, burnt sienna, burnt umber, indigo, purple and other dark shades. Colour combinations can align with the basic grouping of colours, hence varying slightly with well-established western colour combination schemes. Conversely, locally produced Adire fabric designs among the Yoruba shows an economic colour use with a few designs having monochromatic colours. Whilst this is common for locally designed Adire fabrics, the choice of selection of Ankara clothes were mainly colourful. It can be inferred that the cumbersome process of producing multicoloured Adire is a reason for the relatively less availability of the colourful locally produced apparel.

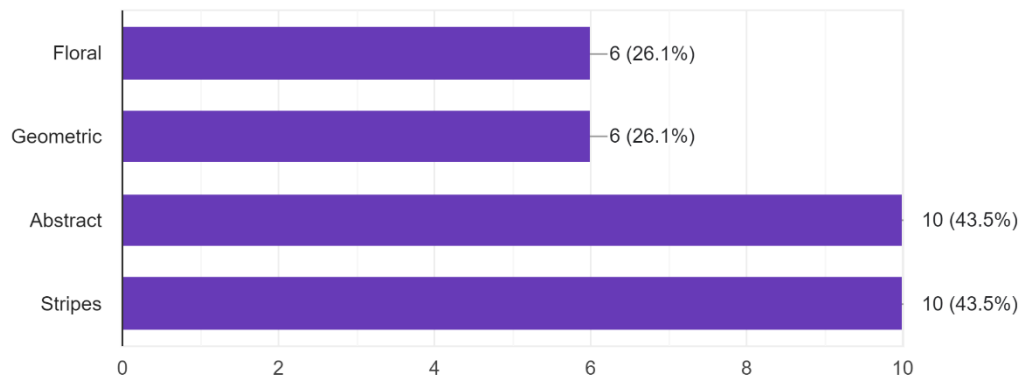


Locally designed fabric. Source: The Lagoon Gallery, Unilag

In northern Nigeria, where religion and culture have profound influence on design appeal, women sometimes dress in Ankara of all shades of colours with a plain or standalone colour hijab for covering head to abdomen. The male gender prefer a non-pattern embellished fabric often in sky blue or white projecting a sense of purity among the northern muslim community. However, whilst Ankara design fabric is not popular among northern males, this gender sometimes have their babariga clothes and hats embellished with a variety of embroidered designs. These embroidered designs may be associated with masculinity as its process of execution and durability are considered of higher societal status of the male gender. In this case, the use of vibrant colours does not portray an individual as belonging to a higher social status. Although, whilst the gender disparity exists among the majority of the northern Nigeria population, there are a few groups that portray unbiased apparel design based on gender difference. The Fulani, the Tiv and the Igala among others have both genders adorn in the same kind of pattern design traditionally. For instance, the black and white stripes of the indigenous people of Benue state (Tachia-Bai & Dajo, 2024) is a relic of consistency in male and female genders apparel patterns. At any rate, fabric designs with stripes and abstract (including embroidered motifs) are the most preferred patterns among Nigerians.

6. What type of fabric designs do you prefer? (Select all that apply)?

23 responses



Gender disparity in traditional fabric design taste is ostensibly most prominent among the Igbo of southeast Nigeria. Igbo women adorn themselves in colourful fabric usually with less busy embellishment unlike the Ankara designs popular among the Yoruba. The design appeal among the Igbo indicates a preference for sparingly distributed standalone motifs derived from recognizable forms. These forms could be simplified animals, letters of the English alphabet, regular shapes, iconic elements and floral motifs. Most Igbo women will wear these fabrics as traditional wrappers combining any of the design with a plain colour blouse. To match and create harmonious colour combination, the colour of the blouse is normally drawn from one of the colours of the fabric patterns and this is exclusively for women. In this case, what counts are the colours combined with blouse and wrapper, not the texture of the fabric. Conversely, the modern Igbo dress culture serve as influence for the growing costume culture in Nollywood (Okadigwe, 2019), with the popularity of Igbo men's traditional Isiagu pinafore worn originally by the Abiriba people of Abia state and the Arondizuogu people of Imo state becoming the traditional design for important men and ceremonies in many part of Igbo nation.

Intersectionality and Nigerian Textile Aesthetics

The intersectional lens, popularized by scholars such as Kimberlé Crenshaw (1989), provides a valuable framework for understanding the complex interplay between textile aesthetics and gender within Nigeria. Intersectionality highlights how other axes of identity, such as ethnicity, class, and religion, intersect with gender to produce diverse experiences and expressions of identity. Recent studies by researchers such as Falola and Oyebade (2019) have explored the intersectional dimensions of Nigerian textile practices, revealing how factors such as regional diversity and socioeconomic status shape individuals' engagement with textile aesthetics and gendered expressions.

The Role of Design Adaptation in Market Competitiveness

The ability of Chinese manufacturers to adapt and domesticate their designs to local tastes has been a significant factor in their success. This flexibility contrasts sharply with the offerings of local manufacturers, who have struggled to compete on both price and design fronts. Akinola and Olowu (2023) suggest that understanding and integrating cultural motifs and consumer preferences into textile designs can significantly enhance market acceptance and competitiveness.

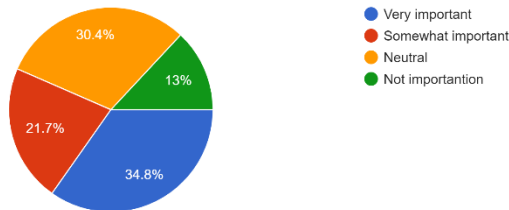
7. Economic Implications

The continued dominance of imported textiles not only poses a competitive challenge but also has broader economic implications. The loss of jobs in the local textile industry and the resultant capital flight are critical concerns. Local manufacturers must therefore innovate and adapt to regain market share and sustain economic viability. The success of Chinese manufacturers in the Nigerian market underscores the importance of aligning product offerings with consumer preferences while maintaining cost competitiveness (Eze, 2023).

Resistance and Innovation in Textile Design

Despite the ways in which textile aesthetics often reinforce traditional gender norms, there is also evidence of resistance and innovation within contemporary Nigerian textile practices. Olajumoke Yacob-Haliso (2015) highlights the role of textile designers and artisans in challenging dominant narratives surrounding gender and promoting alternative visions of identity and expression. Through innovative designs, collaborative initiatives and conscious reinterpretations of traditional motifs, these creators are reshaping the cultural landscape, fostering greater inclusivity and empowerment within Nigeria's vibrant textile heritage. The implication to manufacturers is to stick to indigenous motifs in designing fabrics as most of the population surveyed favoured the incorporation of their cultural motifs into their textile designs as shown in the pie chart below.

14. How important is it for you to incorporate elements of your culture in your fabric choices?
23 responses



8. Recommendations for Local Textile Manufacturers and Designers

To revitalise the local textile sector, Nigerian producers must employ a multifaceted strategy including market research and customer insights, design innovation synthesizing indigenous motifs and patterns as well as cost management:

Market research and customer insights: Conducting extensive market research to understand changing consumer preferences and trends is critical. This includes researching popular designs, hues, and motifs that appeal to different ethnic groups in Nigeria.

Design Innovation: Investing in design innovation that combines traditional Nigerian aesthetics with current trends might help local producers differentiate their products. Collaborations with local designers and artisans might provide a competitive advantage.

Cost Management: Improving operational efficiencies to lower production costs will help local manufacturers compete with less expensive imported fabrics. Cost savings can be achieved by leveraging technology and optimising supply chain processes.

9. Conclusion

The decline of Nigeria's textile industry underscores the need for local manufacturers to adapt to market dynamics and consumer preferences. By focusing on design innovation, cost management and effective branding, local textile firms can regain their competitive edge and contribute to the sustainable development of the Nigerian economy. The experience of Chinese manufacturers in the Nigerian market offers valuable lessons on the importance of

aligning product offerings with local tastes and preferences. Moving forward, it is essential to continue engaging in interdisciplinary dialogue and research that celebrates the diversity of traditional expressions and experiences within Nigeria's rich textile traditions, thereby fostering a more inclusive and equitable cultural landscape for all.

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Effect of Physical Activity and Health Education Intervention on Glycemic Type 2 Diabetes Mellitus Patients Attending Borno State Specialist Hospital, Maiduguri

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Abstract. This study assessed effect of physical activity and health education intervention on glycemic Type 2 diabetes mellitus patients attending Borno State Specialist Hospital, Maiduguri. To achieve this, two hypotheses were tested. Pre-test post-test research design was adopted for the study. The sampled population is forty (40) type 2 diabetics patients attending Borno State Specialist Hospital, Maiduguri. Availability sample procedure was used to select all respondents for the study. The participants completed a general information form included question on age, marital status, family history of the disease, duration of the disease, clinical characteristics, awareness of diabetic complications, taking oral diabetic among others. The researchers recorded the last reading for (glycated hemoglobin [HbA1c]) for each patient.

Education intervention was conducted in type 2 diabetes mellitus samples for 8 weeks containing lectures, discussion and physical activity. At the meetings, they were recommended and gave the information about diabetes and its complications, proper diet, exercise every day at least 30 min such as bike, walking, and aerobic, taking education regularly as directed by the physician, self-monitoring patient's blood sugar, diabetic foot care, and not smoking. Descriptive statistics of frequency count, percent, mean and standard deviation was used to described the respondent characteristic parameter while inferential statistics of The Wilcoxon signed rank test was used to test the formulated hypotheses at 0.05 level of significance. The result shows that both physical activity and health education intervention have

significant effect on glycated hemoglobin [HbA1c] of Type 2 Diabetes Mellitus Patients ($P < 0.05$). It was then recommended that medical practitioners should provide health education intervention programs that will increase awareness among diabetes mellitus patients.

Keywords: Physical Activity, Health Education, Intervention, Glycemic Type 2 Diabetes, Mellitus Patients.

1. Introduction

Physical activity is broadly defined as any bodily movement that is above resting conditions, whereas exercise is planned or structured movement with specific intent on gains in aerobic and/or muscular fitness. Most recommendations by the American College of Sports Medicine (ACSM) and/or American Diabetes Association (ADA) for physical activity/exercise focus on frequency, intensity, and modality to favorably impact glycemic control (Colberg, 2016; Piercy, 2018). Included within modality are considerations including volume or the duration/repetitions of the exercise being completed. Additionally, aerobic exercise intensity is primarily determined using a percentage of one's maximal heart rate (% HRmax) and maximal oxygen consumption and utilization (%VO₂max) 5, 6. It is also worth mentioning that rating of perceived exertion (RPE) is a practical tool people can use to estimate exercise intensity if they are unable to use heart rate or have maximal fitness tests conducted (Colberg, 2016; Piercy, 2018).

Type 2 Diabetes Mellitus (T2DM) is one of the main causes of increasing global health morbidity and mortality for 80-90% of all diabetes cases (Dixit, Maiya, & Shastri, 2017). The increasing prevalence of T2DM is followed by some of the most influential factors such as age, obesity and a sedentary lifestyle (Lazarevic et al., 2006). The factors that affect the increase of T2DM over a long period of time leads to a variety of abnormalities in various organs, including microvascular, macrovascular, neurological and infectious complications (Najafipour, Aliasgarzadeh, Niafar, & Mobasseri, 2012). The number of persons with diabetes continues to increase worldwide, and the International Diabetes Federation (IDF) reported that the number of patients with diabetes worldwide was projected to increase to more than 300 million people in 2025 and 366 million by 2030 (International Diabetes Federation, 2013; Lee, & Kang, 2015). Diabetes, a metabolic disorder characterized by hyperglycemia, is divided into two types. Type 1 diabetes occurs when the pancreas fails to secrete

insulin, and type 2 diabetes occurs when the pancreas retains some capacity to secrete insulin but insulin resistance is increased for a variety of reasons (Karoline de Moraes, Sales & Alves de Almeida, 2015). Insulin controls blood glucose by facilitating glucose intake or inhibiting gluconeogenesis. Insulin resistance is a condition in which the action of insulin is decreased, although the level of insulin is not insufficient. Chronic hyperglycemia is definitely related to complications of diabetes that damage the kidneys, eyes, nerves, heart, and blood vessels (Alsenany & Al Saif, 2015). Therefore, glycemic control is the most fundamental way to manage this disease.

It is estimated that 90% of cases of type 2 diabetes could be prevented if people adopted healthy lifestyle behaviors, including regular physical activity, a moderate diet, and modest weight loss. For people with prediabetes, healthy lifestyle measures are more effective than medication for delaying or preventing the development of diabetes, and exercise (endurance and/or strength training) are important to prevent diabetes. Also important is a moderate diet to control body fat. Nigeria is a developing nation that is plagued with low level of education, superstition, poverty, poor health care services, and near nonexistent health statistics. If the costs of diabetes in America are more than USD 132 billion a year (according to the American Diabetes Association) and about 100 million people have diabetes mellitus (Hales, 2009), the situation in Nigeria could be better imagined than experienced. Sequel to this, it became imperative to review preventive efforts because prevention of diabetes mellitus is better than cure, and also because Nigeria offers abundant opportunities for physical activity and local diet, the key preventive and management components of diabetes mellitus.

Diabetes is considered as serious condition that can be prevented through proper information and provision of proper health education interventions, and provision of health education sessions produces incredible change in the knowledge, attitude, and the behaviour among the patients to manage their self -blood sugar level more efficiently (Pai, Chiu, Liu, Chen, & Peng, 2021, Alibrahim, A., AlRamadhan, Johny, Alhashemi, Alduwaisan, & Al-Hilal, 2021). DM type 2 is a common multifactorial genetic syndrome that affects the individual's families. Different risk factors like unhealthy life style, smoking, alcohol consumptions, family history and diet are the major leading cause of type 2 diabetes; uncontrolled blood sugar may lead to further complications of renal failure, myocardial infarction, amputation, blindness, and hypertension (Anjana, Unnikrishnan, Mugilan Jagdish,

Parthasarathy & Deepa, 2018; Kalra, Das, Md, Shaikh, Shah, & Rehim, 2021).

Proper compliance with dietary guideline, self-care, physical activity, and treatment may reduce the progression of disease, and the most common cause of increased prevalence of diabetes among the general population is lack of knowledge and physical inactivity (Eknithiset, Samrongthong & Kumar, 2018; Stenov, Wind, Vallis, Reventlow & Hempler, 2019). Health care providers strongly recommend the diabetic patients to exercise regularly, to follow their dietary plan and to adhere with medication schedule, and it is also important for diabetic patients to have a regular health check -ups for their personal health (Cunningham, Crittendon, White, Mills, Diaz, & LaNoue, 2018). Health education strategy is very important in maintaining of blood sugar level, which will help population to be aware of the disease and its consequences, and maintain that health care facilities should provide necessary information about diabetes on regular patient counselling sessions along with their routine treatment that might benefit their health outcome positively (Lee, Chan, Chua, Ng, Paraidathathu & Lee 2016). Health education trainings /workshops/ seminars with proper information are the utmost need of the patients for timely reduction of morbidity and enhance the confidence among diabetic patients by self-care diabetes management (Gurmu, Gela, & Aga, 2018). Adeniyi, Ogwumike, Oguntola and Adeleye (2015), conducted study in Nigeria and found that a total of 156 representing 68.7% of the participants presented with low levels of physical activity, while the remaining 21.3% presented with moderate to high level of physical activity. It is against this back ground that this study was conducted to examine effect of physical activity and health education intervention on glycemic type 2 diabetes mellitus patients attending Borno State Specialist Hospital, Maiduguri.

1.1 Hypotheses

The following hypotheses were tested:

Ho₁: Physical activity and health education intervention has no significant effect on glycated hemoglobin [HbA1c] of Type 2 Diabetes Mellitus Patients.

Ho₂: Physical activity and health education intervention has no significant effect on fasting blood sugar [HbA1c] of Type 2 Diabetes Mellitus Patients.

2. Research Methodology

2.1 Research Design

Pre-test post-test research design was adopted for the study. Smith (2021), the pre-test post-test research design is useful for evaluating the effectiveness of interventions. The design involves measuring the participants' levels on an outcome variable before and after the intervention (Johnson, 2019). The differences between the pre-test and post-test scores can provide insights into the intervention's impact. However, as pointed out by Brown (2020), this design has limitations, such as the possibility of participant attrition and maturation effects. To overcome these limitations, researchers can employ a control group or use a mixed-methods approach that includes qualitative data collection (Davis, 2018).

The participants completed a general information form included question on age, marital status, family history of the disease, duration of the disease, clinical characteristics, awareness of diabetic complications, taking oral diabetic or insulin injection, smoking, following any diet, daily activity, and education level. We recorded the last reading for (glycated hemoglobin [HbA1c]) for each patient. Education intervention was conducted in type 2 diabetes mellitus samples for 8 weeks containing lectures, discussion and physical activity. At the meetings, they were recommended and gave the information about diabetes and its complications, proper diet, exercise every day at least 30 min such as bike, walking, and aerobic, taking education regularly as directed by the physician, self-monitoring patient's blood sugar, diabetic foot care, and not smoking. Each giving education, we always examine weight, waist size, blood pressure, and FBS.

The education services included, about self-management plan like examined Fasting Blood Sugar (FBS) by self with the portable measuring instrument, and injected insulin by self, knowledge about glycemic control by HbA1C every 3 months. Since almost all patients did not know about HbA1c, they just know that FBS examination was enough for glycemic control. Furthermore, we gave the patient diet and exercise management. Giving the education for diabetes mellitus patients was necessary for increasing of the understanding the patients about the disease because there were still many type 2 diabetes mellitus patients that have a lack of knowledge about the management of the disease both about the diet and the physical exercise. We advised the patients for exercise every day minimal for 30 min. Every month until 8 weeks, we gave the education and we always examine FBS the patients every 2 weeks and in the 8

weeks, we examined HbA1c for the patients. The sampled population is forty (40) type 2 diabetics patients attending Borno State Specialist Hospital, Maiduguri. And availability sample procedure was used to select all respondents for the study. Descriptive statistics of frequency count, percent, mean and

standard deviation was used to described the respondent characteristic parameter while inferential statistics of The Wilcoxon signed rank test was used to test the formulated hypotheses at 0.05 level of significance.

3. Results

Table 1: Respondent characteristic Parameter n=40

Variables	n	%
Gender		
Male	10	25
Female	30	75
Age group		
Early elderly (40–55 y)	11	27.5
Further elderly (55–65 y)	15	37.5
Seniors (>65 y)	14	35
Education levels		
Primary high school	2	5
SSCE Certificate	26	90
Tertiary Certificate	2	5
Familial history		
Maternal history	4	10
Paternal history	6	15
Not knowing	30	75
Management of diet		
Regular	12	30
Irregular	28	70
Type of physical activity		
Jogging	15	62.5
trekking	25	37.5
Type of treatment		
Oral diabetic	38	95
Insulin injection	2	5

Table 1 which is on respondent characteristic parameter indicated that 10 (25%) were male, while 30(75%) were female. The table also revealed that 11(27.5%) were 40–55 years, 15(37.5%) were 55–55 years, while 14(35%) of the respondents were 65years and above. Similarly, the shows that 2(5%) of the respondents were primary leaving school certificate, 26(90%) were SSCE certificate, while 2(5%) were tertiary certificate holder. 4(10%) of the participants had maternal history, 6(15%) had paternal history, while 30(75%) had unknowingly. On the aspect of diet management, 12(30%) of respondents engaged in regular exercise while, 28(70%) do not practice exercise. 15(62.5%) of the patients chose to jog, while 25(37.5%) chose trekking distance as type of physical exercise. Furthermore, most of our respondents 38(95%) used oral diabetic treatment while 2(5%) used insulin injection.

Ho₁: Physical activity and health education intervention has no significant effect on glycated hemoglobin [HbA1c] of Type 2 Diabetes Mellitus Patients.

Table 2: Wilcoxon signed rank test summary on effect of physical activity and health education intervention on glycated hemoglobin [HbA1c (%)] on Type 2 Diabetes Mellitus Patients

variables	Mean	Standard Deviation	Median	Z	Prob
Pre test	8.89	1.79	8.50	4.191	0.019
Post test	8.67	1.64	8.34		

Z=4.191; P<0.019

A Wilcoxon signed-rank test showed that a 8 week, trice weekly physical activity and health education intervention did elicit a statistically significant change in glycated hemoglobin [HbA1c] on Type 2 Diabetes Mellitus Patients ($Z = 4.191, p = 0.019$). Indeed, median of physical activity and health education intervention Score rating was 8.50 for pre- treatment and 8.34 for post-treatment. Therefore, physical activity and health education intervention have significant effect on glycated hemoglobin [HbA1c] of Type 2 Diabetes Mellitus Patients ($P < 0.05$).

H_0 : Physical activity and health education intervention has no significant effect on fasting blood sugar [HbA1c] of Type 2 Diabetes Mellitus Patients.

Table 3: Wilcoxon signed rank test summary on effect of physical activity and health education intervention on fasting blood sugar [FBS (mg/dl)] on Type 2 Diabetes Mellitus Patients

variables	Mean	Standard Deviation	Median	Z	Prob
Pre test	241.83	88.75	238.41	3.283	0.001
Post test	217.88	66.42	215.53		

$Z=3.283; P < 0.001$

A Wilcoxon signed-rank test showed that 8 weeks, trice weekly physical activity and health education intervention did elicit a statistically significant change in fasting blood sugar (FBS) on Type 2 Diabetes Mellitus Patients ($Z=3.283; P < 0.001$). Indeed, median of physical activity and health education intervention Score rating was 8.50 for pre- treatment and 8.34 for post-treatment. Therefore, physical activity and health education intervention have significant effect on fasting blood sugar (FBS) of Type 2 Diabetes Mellitus Patients ($P < 0.05$).

4. Discussion of findings

This study assessed effect of physical activity and health education intervention on glycemic type 2 diabetes mellitus patients attending Borno State Specialist Hospital, Maiduguri. The result indicated that physical activity and health education intervention have significant effect on glycated hemoglobin [HbA1c] of Type 2 Diabetes Mellitus Patients ($P < 0.05$). The result of this study is consistence with the study of Rusdiana, Savira, Widjaja and Ardinata (2020), who assessed effect of health education on control glycemic at Type 2 Diabetes Mellitus Patients and found a significant decrease on glycemic control on FBS for the Type 2 diabetes mellitus participants, but there was no significant HbA1c value by the end of the health education for 3 months. A study conducted by (Heisler, Smith, Hayward, Krein and Kerr 2003), assessed the effect of diabetes self-management education on HbA1c level and FBSnat type 2 diabetes mellitus patients in PHC in Binjai city showed that a decrease in HbA1c and FBS after giving education for 3 months which is in line with the result of this study. Other research showed that educational interventions effectively improved glycemic control and are, thus highly recommended for diabetic patients (Rusdiana, Savira & Amelia, 2018). Furthermore, the other research about analysis of factors affecting the self-care behaviors of diabetes mellitus type 2 patients in Binjai, North Sumatera – Indonesia showed that

self-care behaviors of type 2 diabetes mellitus in Binjai are significantly influenced by motivation, self – efficacy, communication, knowledge, and attitude (Rusdiana, Savira & Amelia, 2017).

Moreover, a related study conducted by Park and Lee (2015), found that Factors found to be significantly related to glycemic control included income level, physical activity based on intensity of aerobic exercise, use of diabetes medicine, presence of hypertension, duration of diabetes, and waist circumference. In addition, engaging in combined low- and moderate-intensity aerobic exercise when adjusted for resistance exercise was found to lower the risk of glycemic control failure. The authors explained further that If a patient with type 2 diabetes gets moderate exercise, the amount of glucose in peripheral use will become greater than the level of glucogenesis in the liver, thus decreasing blood glucose. Although the secretion of blood insulin is also decreased, hypoglycemia will rarely occur (Min, & Park, 2006). However, high-intensity aerobic exercise can promote glucogenesis and induce hyperglycemia by increasing the concentration of blood cat-echolamine.

Health education is an important intervention in preventing the general public from non-communicable diseases. The respondent’s knowledge improved significantly after face-to-face 8 weeks session on diabetes. Research suggests that the timely information could prevent a large number of diabetes-related risk factors among the patients. Hence, this study has highlighted the value of health education sessions among Type 2 Diabetes Mellitus Patients. This can be confirmed as physical activity and health education intervention have significant effect on fasting blood sugar (FBS) of Type 2 Diabetes Mellitus Patients ($P < 0.05$). The result of this study is agreed with the study of Nazar, Khan, Kumar and Hafeez (2019), who studied effectiveness of health literacy intervention on cardiovascular diseases among university students of Pakistan, and reported that

mortality and morbidity by CVD can be reduced by the effective awareness intervention. The finding of this study is similar with the findings of Kumar, Rehman, Baloch, Vankwani, Somrongthong, and Pongpanich (2022) who reported that health education intervention has proved to be effective for the prevention of diabetes among teaching staff. However, prior to this intervention, participants had limited knowledge about diabetes, which statistically improved after giving the health education sessions at their work place. These findings were supported the interventional studies conducted in Pakistan (Khan, Walley, Khan, Hicks, Ahmed & Khan, 2018; Akhtar, Nasir, Abbas, & Sarwar, 2019), where it has been proved that the health education can change individual's knowledge and behaviors to prevent certain diseases and infections.

5. Conclusion

It was concluded that physical activity and health education intervention have effect on glycated hemoglobin [HbA1c] of Type 2 Diabetes Mellitus Patients.

6. Recommendations

The following recommendations were made:

- Medical practitioners should provide health education intervention programs that will increasing awareness among diabetes mellitus patients.
- Exercise such as jogging or aerobic for 30 min every day or awareness of activity daily should be considered important in the management of diabetes mellitus.

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Peace and Conflict Impact Assessment of Development Intervention on Conflict Dynamics in Gbaramatu Kingdom

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Abstract. Infrastructural deficit accentuates the narratives on conflict and development trap in communities of Nigeria's Niger Delta Region. Development intervention is a widespread strategy to address intractable conflicts in the region. This article examines peace and conflict impact assessment of development initiatives by Delta State Oil Producing Areas Development Commission on conflict dynamics in Gbaramatu Kingdom. The article adopted both survey and case study designs, using development projects in Okerenkoko and Oporoza communities. Empirically, indicators were carefully formulated to measure impact of development intervention and shed light on conflict dynamics against the backdrop of delta-wide analysis. The underpinning assumption was that development projects have heightened tension in Gbaramatu communities, the seat of militant resistance to the Nigerian government. This assumption was tested by an analysis of conflict indicators and lived experiences. Empirical evidence seems to affirm that this does not hold true in Gbaramatu communities that are yearning for rapid infrastructure development.

Keywords: Peace and conflict impact assessment, conflict dynamics, project partner, development intervention, Gbaramatu Kingdom, Delta State Oil Producing Area Development Commission

1. Introduction

Development intervention is a dominant strategy to address intractable conflicts in Nigeria's Niger Delta Region. It has generated immense scholarly interest because of the entrenched violent culture, due to agitation for resource control and infrastructure deficit. The government, at different levels, had attempted various intervention policies, schemes,

programmes and institutional responses, with appropriate legislation, to engender inclusion and peacebuilding, through community participation and ownership. The various schemes and policy options were to address the hydra-headed challenges of underdevelopment and violent conflicts, emerging from perceived political and economic exclusion of communities from mainstream operations of the oil and gas industry. The Delta State Oil Producing Areas Development Commission (DESOPADEC), established on 16th July, 2007, was one of such government interventions. The mandate of DESOPADEC is to “rehabilitate, rejuvenate and revive the physical, economic and social well-being” of the oil-producing communities of Delta State (*DESOPADEC Act, 2006: Section 13 (1)*). Oil-bearing communities are communities hosting oil wells, manifolds, platforms, flow stations, pipelines etc., and have been impacted upon by oil exploration. Since its inception, DESOPADEC has been engaged in diverse development projects and empowerment initiatives to address the issues of infrastructure and human capital deficit. Thus, it has overtly and covertly addressed the root causes of conflicts in the region.

The interaction between social infrastructure deficit and the conflict situation in Nigeria's Niger Delta underscores a complex phenomenon (Jarikre, 2016, 98) and development intervention, towards tackling the twin issues (conflict and lack of social infrastructure), though “development intervention processes remain insensitive to conflict dynamics” (IPCR, 2002:1). Hence, as a policy option, the Institute for Peace and Conflict Resolution (IPCR) recommended Peace and Conflict Impact Assessment (after now PCIA) a requirement for development interventions in Nigeria (Jarikre, 2016, 98). Given the extent and prolonged character of conflicts and

development interventions in the oil-bearing communities, PCIA promises to be very useful in making the interventions meaningful and sustainable. It promises, also, to contribute to the understanding of the uses and advantages, as well as developing the tools of PCIA.

PCIA is a means of assessing the ways in which an intervention may affect, or has affected the dynamics of peace or conflict in a conflict-prone region (Bush, 2009). Bush seems to have evolved the concept beyond a process that will help ensure that a development project does not make conflict worse and, as far as possible, it should help to build peace. According to him, it is a methodology or means of “anticipating, monitoring, managing and evaluating the ways in which an intervention may affect, is affecting, or has affected the dynamics of peace or conflict in a conflict prone region” (Bush, 2009, 7). As he noted, PCIA “differs from evaluation” in the conventional sense because its scope extends far beyond the *stated* outputs, outcomes, goals and objectives of conventional development projects” (Bush, 1998, 8).

After several years of development interventions, what is the relationship between development projects and conflict dynamics in Gbaramatu Kingdom? Is there an increase in conflict dynamics because there is increased development intervention? Does conflict dynamics increase development intervention? Therefore, a PCIA of DESOPADEC’s development projects on conflict dynamics examines whether the projects in Gbaramatu Kingdom generated new conflicts, fed into or escalated the ongoing conflicts (the unending resource control agitations due to underdevelopment in the region). In other words, has the commission’s development projects heightened the peoples’ vulnerability, by deepening the causes of conflict, introducing new conflicts and division among community members, and enhancing the opportunities of joining militant groups? The underpinning assumption is that development projects have heightened tension in a territory largely perceived as the seat of militant resistance to the Nigerian government. This assumption was tested by an analysis of conflict indicators and an assessment of people’s lived experiences.

This article will limit the use of the term PCIA to conflict dynamics (for the peace dynamics of development projects, see Jarikre, 2018). Whereas researchers have offered profound theoretical arguments on the nexus between development projects and peacebuilding, through evaluation of peacebuilding using PCIA lens, there is not so much

on PCIA of conflict dynamics in the Niger Delta Region. There is limited research on PCIA, in relation to assessing the impact of development projects on conflict dynamics, in the search for models and transition to sustaining peace and security in the region. Ostensibly, the article will attempt to bridge the existing gaps, posed by lack of data in the evaluation literature on impact assessment of development and peacebuilding in the region. This article will also contribute to the growing discussion on the nexus between peace/conflict and development by substantiating the concept of PCIA.

The first section of this article will provide a conceptual scoping of PCIA on conflict dynamics. It will be followed by historicizing the baseline and conflict profile of Gbaramatu kingdom to underscore the challenges of local communities in the Niger Delta. It will then discuss the impact of DESOPADEC’S development initiatives on conflict dynamics. Though the development projects are specific to Okerenkoko and Oporoza communities in Gbaramatu Kingdom, in many ways, the issues have broader Niger Delta implications in terms of causes, community grievance, escalation trajectory and micro-level conflicts. Empirically, the article conceptualized conflict indicators, that are dialectically connected to one another, to examine the impact of development intervention and shed light on the conflict dynamics.

2. PCIA and Conflict Dynamics

Conflict as an inherent phenomenon ubiquitous with human existence has been conceptualized and theorized “as a multi-dimensional construct” (Humphrey, Aime, Cushenbery, Hill, and Fairchild, 2017, 58). The etymological foundation of the word ‘dynamics’ is rooted in the sciences and ascribed to the experimentation of Galileo, a 16th century scientist (Encyclopedia Britannica). Within the social sciences, dynamics involves any systemic social interaction (Social Dynamics Definition, Types & Examples, 2023), and energy supporting moving society forward and changes in society. In this sense, dynamics encompasses the energies of men and the results these energies have wrought accordingly (Vance, 1945, 123). Thus, Nicaise, (2014, 15) described conflict dynamics as the resulting interaction between the conflict profile, the actors and the causes of conflict.

Not only do scholars provide fundamental definitions but they also provide a strong sense of the multifaceted nature of conflict dynamics. While Rothbart (2020, 23 - 24) asserts that the power of state management significantly impacts on conflict dynamics, Weiss, Tsur, Miodownik, Lupu, and Finkel (2022), argued, in

particular, that scholars could well comprehend conflict dynamics by focusing beyond the established, typical, and predictable patterns of violence. This is because “atypical violent events can fundamentally alter established conflict dynamics.” They define atypical violence as “if they differ from the observed contemporaneous conflict dynamics” (Weiss et.al, 2022, 1, 2).

Conflict dynamics in development intervention is complex to define and measure as Barron, Diprose and Woolcock (2011,8) bluntly observed, “no one knows how to do this, at least not in the way we know how to do other complex tasks such as removing tumors from the pre-frontal cortex (brain surgery) or putting spaceship on mars (rocket science).” Ostensibly, the amorphous nature of conflict dynamics could be due to lack of toolkit and the endemic feature of the type of development challenge (Barron, Diprose and Woolcock, 2011, 8). As Diehl (2006) observed, there is a plethora of studies on conflict dynamics that focus on narrow time frame and immediate outcomes. For him, to break free from the strong hold of single conflict shape analysis, he suggested the examination of several distinct phases of conflict to determine the connection.

Development interventions in complex environments of vulnerable individuals and communities, can cause grievances, which are precursors to conflict dynamics. The issue, therefore, is how can these be prevented or mitigated in ways that do not inadvertently fuel them? This is supposedly the broader goal of peacebuilding. Thus, the recognition that domestic conflict could seriously disrupt development projects made the consideration of violence and its impact central concerns of development initiatives (Barron, Diprose and Woolcock, 2011, 29). This provided the impetus for the search for new instruments, either through adaptation or to further develop requisite planning and management tools (Zupan, 2005, 50). One of such instruments developed was PCIA, as a means of ensuring that development projects in conflict zones reflect the priorities of peace and conflict dynamics. Retrospectively, PCIA was formulated by Kenneth Bush in 1998 who conceptualized it as a “means of evaluating (ex post facto) and anticipating (ex ante, as far as possible) the impacts of proposed and completed development projects” (Bush, 1998, 7). In view of Bush’s definition, it becomes clear that PCIA is concerned with assessment of impact through a series of processes, and ultimately as a framework to overcome structures of violence (Jarikre, 2018, 50) and long-term sustainable change. This line of argument is further buttressed by Barasa – Mang’Eni (2014, 59) who asserts that PCIA is viewed as a means

to assess how interventions and assistance in conflict situation carries the potential to either exacerbate conflict or contribute to peace. In this sense, PCIA focuses on affected populations and impacts across sectors (social, economic, political and environmental), as well as assesses actions that bring change in people’s lives.

3. Baseline and Conflict Profile

Gbaramatu Kingdom, with nine communities, several fishing ports and hamlets, lies along the fringes of the Western Niger Delta. Gbaramatu communities are oil-bearing, hosting oil wells, manifolds, platforms, flow stations, pipelines, etc. The local population is predominantly engaged in fish farming but unfortunately the environment and aquatic life have been negatively impacted upon by extractive activities, particularly oil exploration/exploitation. There is a huge deficit of social infrastructure, such as health care facilities, and pipe borne and portable water (Jarikre, 2018:51). The social and economic environment depicts negligence and government absence, as the national economy depends more on government expenditure and capital investment. Interestingly, as Courson (2007) noted, this deplorable socio-economic environment of a host community to Chevron Texaco Unlimited is precursor to community grievance and militant activities.

Tompolo’s ‘Camp 5’, located along the dreaded Chanomi Creek in Gbaramatu Kingdom was the garrison headquarter of the Movement for Emancipation of Niger Delta (MEND) (Omonobi, 2009, Jarikre, 2017). Presumably, MEND, under the command of Tompolo, was a defunct militia group against government policies of political exclusion, marginalization and underdevelopment of the Niger Delta oil-bearing communities. MEND militants on the Chanomi creeks coordinated attacks, hostage taking and killing of staff (especially foreigners and expatriates) of multinational oil and gas corporations (Owen, 2009; Jarikre, 2017). They were also involved in pirating local traders on transport boats to cart away their wares. They also raped women, while some lost their lives in the process.

At the peak of the Warri crisis in March, 2003, the Joint Military Task Force (JTF) launched massive military onslaughts against militants’ strongholds in Gbaramatu Kingdom. Also, in 2009, JTF launched another military offensive to dislodge the dreaded forces of MEND, under the command of Tompolo (Jarikre, 2018). In 2016, the Niger Delta Avengers (NDA) emerged to contest government’s reprehensible marginalization of the Niger Delta

Region (Courson, 2017). It reportedly claimed responsibility for the attack on critical oil and gas infrastructure and assets in the Niger Delta (Courson, 2017; Jarikre, 2017). As Holodyn (2016) observed, the NDA appeared to echo the agenda of MEND, struggling for a greater part of oil revenue for the impoverished region. Between 2016 and 2018, the JTF in the Niger Delta launched a manhunt in the creek communities, in search of the former MEND warlord, Government Ekpemupolo, popularly known as Tompolo, who was believed to be holed up in the labyrinth of Oporoza, his ancestral home.

Due to its dynamic nature, Gbaramatu kingdom is replete with militant activities and social disintegration, due to agitations for resource control. Ethnic conflicts provide profound contexts to explore the nexus between development and conflicts, in order to understand the fundamental complexities of conflict dynamics in development intervention. The communities in Gbaramatu appear like hundreds of thousands of creek communities in the Niger Delta. Ostensibly, Okerenkoko and Oporoza communities are significant hot beds of violent confrontations between state and non-state actors (militia groups) (Courson, 2017). Suffice to say that it is not a quintessential creek or riverine community; therefore, the task of development intervention could not be straight forward, not only because it is a difficult terrain, but also one with intense insecurity challenges. Gbaramatu Kingdom, though considered a highly volatile hub of militant activities, the communities are oasis of harmony and cohesion, bonded and loyal to the leadership of Tompolo, former MEND commander and spiritual leader of Egbesu Cult.

4. PCIA of DESOPADEC's Development Projects on Conflict Dynamics

Sharing the laudatory objective of reducing violence and the development of Gbaramatu communities for peace, DESOPADEC's development intervention in Gbaramatu Kingdom is a sterling case study of institutional capacity for conflict sensitivity. This is so because its mandate derived from the Act establishing the Commission. Its operational guidelines and financial regulations are explicit, thorough and coherent for the purpose. For instance, the commission's policy for project delivery is that development projects are outsourced to local contractors who should also take responsibility for community relations. In this way, contractors are to address community conflicts, issues and interests arising from the implementation of the project. The use of local contractors is a strategic step to empower community members, ensure efficient community

relations and mitigate possible risk implications for security. However, it leads to conflict over obtaining contracts in some cases (WAC Global, 2003; Jarikre, 2018).

Findings from a study on the institutional capacity of DESOPADEC to mainstream conflict sensitivity, in its development intervention in Gbaramatu Kingdom, appears consistent with conflict-sensitive approaches in development practice (Resource Pack, 2004, McIntosh and Buckey, 2015; Jarikre, 2018). The approaches are about how DESOPADEC's activities will not create, feed into or contribute to the exacerbation of tension. From the study, development interventions in peacebuilding and conflict sensitivity exist in a web of relationships where the interactions are intrinsically linked. As Jarikre (2018), argues, the use of its human and organizational capital (skill, knowledge and competencies), capacity of project partners, policy framework and practice underscore its capacity within the broader framework of conflict sensitivity in development and peacebuilding interaction (p. 141). This presupposes that the bulk of conflict sensitivity lies on the institutional ability of development agencies to mainstream conflict sensitivity into the development project delivery process (See Jarikre, 2018).

This article adopts the ex post facto research design, using both survey and case study designs. PCIA is dependent on lived experiences and their participation is central to assessing the impact of project intervention. As Bush (2003:6) noted, the people living in the conflict environment are "the real experts in PCIA" as they share their experiences and perceptions on the impact and outcome of the intervention on conflict dynamics. The population of the study consisted of Gbaramatu women, youths, community leaders, DESOPADEC's staff (field and headquarters), project partners/contactors and project staff. The sample population consisted of 432 respondents, spread across the two communities and DESOPADEC. The distribution of sampled population is as follows: Oporoza (196), Okerenkoko (170) and DESOPADEC (66). The population was drawn from selected personalities, including those who are staying outside Gbaramatu area, but are conversant with the conflict in the area, the programmes as well as the activities of DESOPADEC, project partners, staff, government officials (DESOPADEC) and consultants, whose inputs were germane to the study. Random sampling technique was used for the survey while purposive and snowballing sampling techniques were employed for the interviews. The study carried out four major activities of data collection: the use of questionnaire,

In-Depth (IDI) and Key Informant Interviews (KII), Focus Group Discussion (FGD) and case – (a non-participant observation of specific community projects).

This article, like most impact assessment studies, extensively used attribution and triangulation to demonstrate and explain change. Primary data consisted of 432 respondents, derived from two sets of questionnaires administered to community members and DESOPADEC staff respectively. Seven in-depth interviews were conducted with the Commissioner representing Ijaw communities on DESOPADEC's Board, four community chairmen, a traditional ruler and Chairman of Gbaramatu Community Development Committee. Eleven key informant interviews were also conducted with two Special Assistants to the Commissioner, three youth leaders, two contractors, one site Engineer, one market woman and two community members, while a focus group discussion was conducted with DESOPADEC staff. Two levels of sampling were used to elicit relevant information: purposive and incidental. Incidental was used for the survey, and purposive snowballing for the interviews.

Empirically, indicators were carefully formulated to measure impact and shed light on conflict dynamics in development intervention, against the backdrop of lived experiences analysis. These include: factors relating to increased vulnerability of the people and communities, trends that deepen the root causes of conflicts, issues responsible for introducing new conflicts and escalating existing conflicts, and motivation to join militant groups/taking up of arms. For the analysis, the article used the development projects in Okerenkoko and Oporoza and the field responses from the sampled population.

5. Factors Relating to Increased Vulnerability of People and Communities

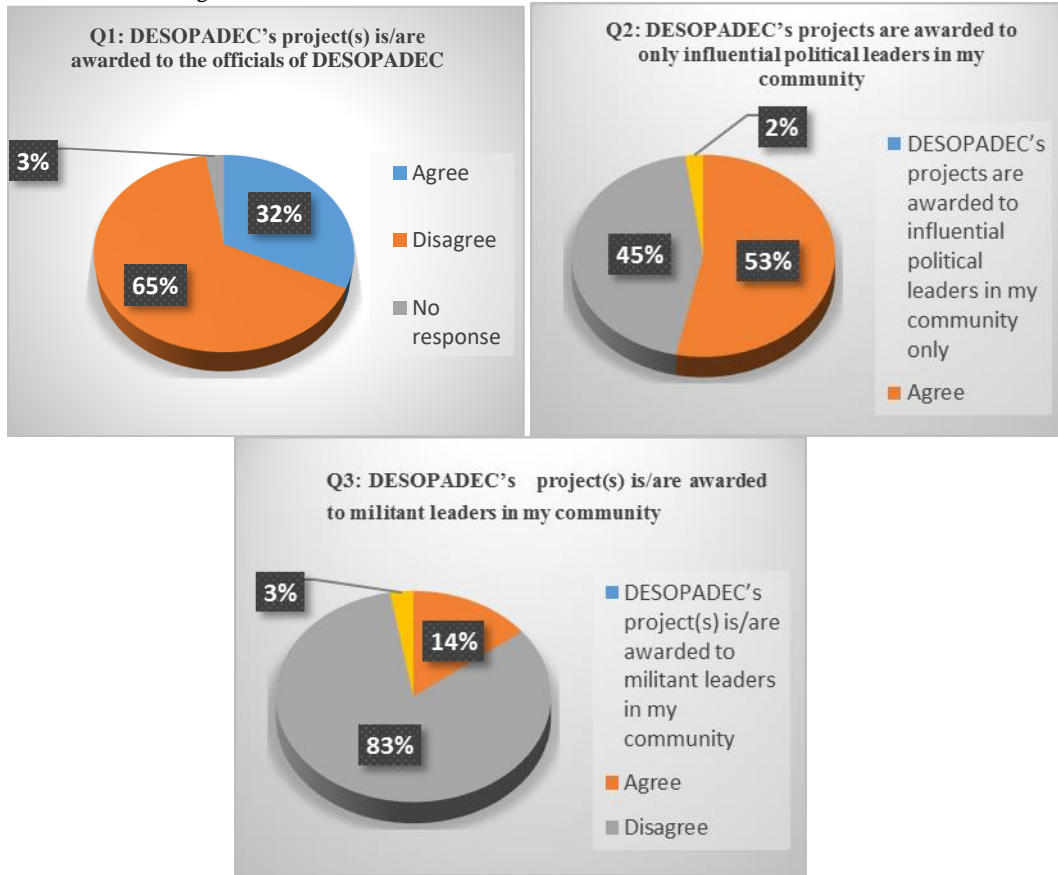
The award of contracts for development projects, in the communities of the Niger Delta region has been a major source of conflict. Project administration in Nigeria, especially contract award, is fraught with malfeasance, due largely to conflict of interest, greed and political patronage. This is often done without consideration of local ownership and contractor's competence, which are germane to project delivery and peacebuilding. Contracts awarded for community development are not accessible by community

members, who are local contractors, but awarded to proxies (such as government officials, including DESOPADEC's staff, politicians and militants) who are external contractors with the same capacity. Such awards create local resentment and antagonism in the community. Broadly speaking, contract award and allocation to community members is a strategic means of building local capacity and community resilience. Conversely, when such contracts are awarded to external contractors, it may result in disempowering the community. Consequently, it inadvertently engenders community vulnerability and violent behaviour because opportunities for community contractors to improve their standard of living and move away from conditions of poverty are denied.

The assumption here is that an overwhelming apathy existed on account of contracts awarded to external contractors, politicians, DESOPADEC's staff and militant leaders, thus, the questions in Cluster 1. Responding to the first question on the cluster, 32% of the respondents agreed that the projects in their communities were awarded to the staff of the commission, while 66% disagreed. In respect to the second question, 10% agreed that militant leaders were the beneficiaries of contracts awarded, while 5% strongly agreed. However, an overwhelming percentage of respondents (82%), in a disaggregated proportion of 50% and 32%, disagreed and strongly disagreed, respectively, that contracts were awarded to militant leaders. For the third question, there appears to be a near balance of responses, as 53% agreed that DESOPADEC's projects were awarded to influential political leaders in their community only. 42% thought otherwise while 2% were undecided.

The aggregate responses in the cluster show that 33.3% agreed, 64.2% disagreed, while 2.3% did not respond to the questions that projects were awarded to politicians, staff, or militants only. The data presented above confirms that the commission's contract award has not been a source of conflict, as no particular group was identified to be the sole beneficiary of contract awards. However, data indicate that the political class appears to enjoy some form of patronage and preference from the commission. Broadly speaking, in Nigeria, the scenario of contract award is fraught with malfeasance due largely to conflict of interest, greed and political patronage (whereby politicians are compensated with contract awards) without consideration of contractors' competence, experience and expertise, which are necessary ingredients for project delivery.

Cluster 1: Percentage Distribution of Orientation towards the Award of Contracts



Source: Fieldwork

The study further confirms that the engagement of local contractors, as project partners by funding agencies and corporations, to deliver projects in the Niger Delta, is a critical factor in several ways. Experience has shown that using local contractors is one of the ways the community can directly benefit, through empowerment and development of local capacity. Another reason is to strategically reduce the incidence of violent conflict and mitigate risk of work stoppage, due to community interference. Also essential is that the process allows for community participation and ownership of the project, premised on the usual complaint that many development projects, delivered by external contractors, are often substandard and unsustainable and, therefore, not functional.

The assumption that external local contractors, who are not indigenes of project benefiting communities, often execute substandard and unsustainable projects is ostensible. After all, we have seen numerous cases of indigenous contractors who have abandoned projects where external contractors have achieved greatly. As Okolie & Edo (2023) noted, neglecting competence and the right skilled people for any

unqualified contractor, on any construction project, will always yield poor project delivery. On account of the above, Yemi Osinbajo observed that “there are signboards of proposed infrastructural projects, mostly uncompleted, and many are abandoned” (Osinbajo, 2017). In fact, incidents abound of community contractors who had abandoned projects soon after collecting contract mobilization (first tranche payment) fees. What is palpable is that efforts to mainstream local turns in peacebuilding (use of local resource, actors and ownership) have diminished project intervention with unsightly effects, due to poor contracting and contractor practices linked to nepotism and corruption. Even so, DESOPADEC's development intervention in Gbaramatu appears atypical, as data reveal a collective will of the people to support and embrace any development project that will alter not only the physical structure but also the socio-economic status and living standards of members of the community.

6. Deepening the Root Causes of Conflicts

Given the complex situation of infrastructure deficit and conflicts in the Niger Delta region, it is clear that

deepening the root causes of conflicts embodies a wide range of issues with differing impacts. They have loosely emerged from frustration resulting from inequitable distribution of infrastructural projects and reduction of communities' ability to legitimately benefit from oil-related resources and opportunities. The issues are due to prolonged neglect, marginalisation and exclusion by government and multinational oil corporations, susceptible political manipulation, and distrust of community leaders who represent selfish interest. More often than not these conditions accelerate, escalate and deepen the root causes of structural conflicts and violence in oil-producing communities such as Gbaramatu. In fact, they have largely intensified and deepened conflicts during development interventions.

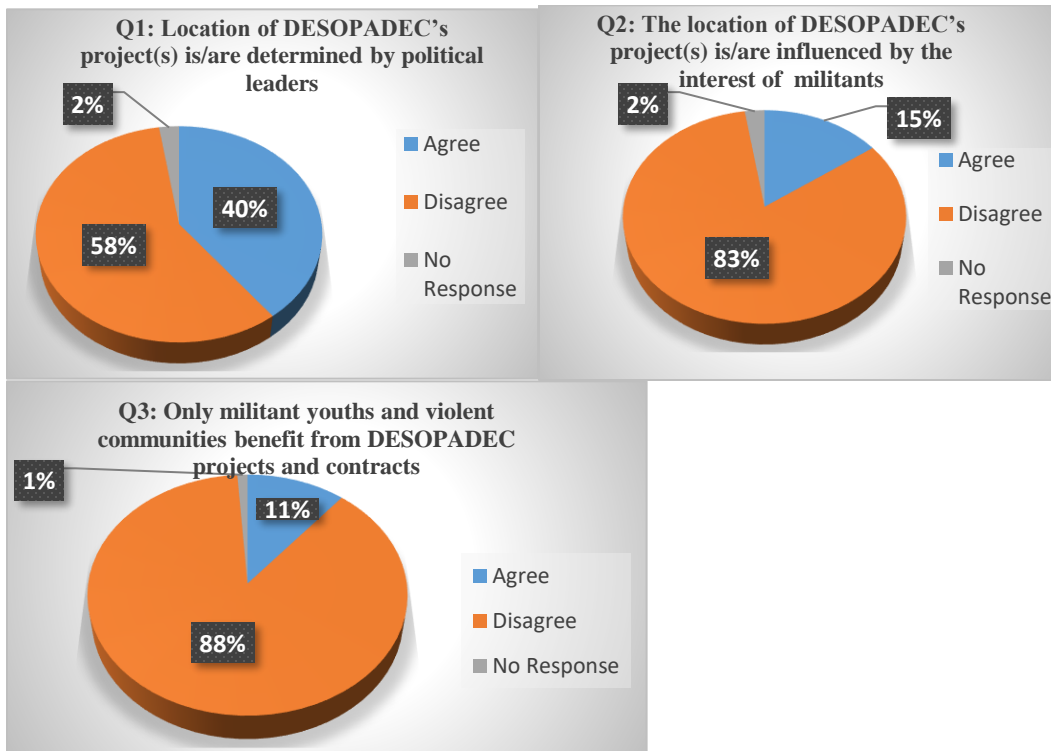
Execution of projects cannot be effectively implemented without the proper selection of project locations at various stages of pre-project planning, either at the level of the commission or the community. The location of development projects is a major source of competition, rivalry and violent conflicts in oil-producing communities of the Niger Delta region where infrastructural deficit is a common denominator. The absence of development infrastructure has been complicated by the consequences of petroleum exploration/exploitation, and increasing materialism as a result of petro-economics. One reason for the unseemly competition and unhealthy rivalry is the desire by individuals, groups and communities to access the benefits of project location such as cash, contract awards, employment opportunity, and legitimacy. The attempts to take such advantages have almost always resulted in leadership tussles and other forms of conflicts in communities.

Thus, many decisions on project location sometimes feed into, escalate, or even introduce new conflicts (WAC Global Services, 2003). For instance, distrust exists among Ijaw communities due to government patronage and location of projects in Gbaramatu Kingdom. There is the common belief, by other Ijaw

communities of Delta State, that Gbaramatu communities received more patronage from DESOPADEC, in terms of project location and appointments, because they are more militant. An implicit assumption of the study in this regard, therefore, was that the location of projects was determined by the interest of political and militant leaders based on community volatility. To this end, the study tried to determine how the location of DESOPADEC's projects impacts on the conflict dynamics in the study locations.

Three questions (Q1, Q2 and Q3) were used to assess how the location of DESOPADEC's projects could feed into, escalate and create new conflicts in Gbaramatu communities. Data obtained suggests that respondents believe that politician have a fair chance of determining the location of projects than militants and violent/militant communities. Responses to the first question on the cluster show that 40% of respondents (25% agree and 15% strongly agree) believe that project location is usually determined by politicians, 58% respondents (55% disagree and 3% strongly disagree) do not believe that politicians determine where projects were located, while only 2% abstained. Responses to the second question in respect to militants' interest show that only 15% (disaggregated as 7% agreed and 8% strongly agreed) believe that the location of DESOPADEC's projects were determined by militants' interests. An overwhelming 83% of respondents debunked the general assertion that militants' interests cannot be ignored in project location. Again, as in responses to the first question, only 2% did not respond to the second question. Responses to the last item in this cluster, indicate that less than 11% (4.3% agreed and 6.2% strongly agreed) claimed that only militant youths and violent communities benefitted from DESOPADEC's projects and contracts. Meanwhile, 88.3% of respondents (disaggregated 58% disagreed and 30.3 strongly disagreed) did not believe that militant youths and violent communities were given preference in terms of project distribution and contract awards. Only 1.2% left the question untreated.

Cluster 2: Percentage Distribution of Response to the Location of Projects



Source: Fieldwork

The aggregate of responses in the cluster shows that 22% agreed, 76% disagreed while 2% did not respond to the questions. The data suggest that politicians appear to have an edge over militants or violent communities in determining the location of projects. It does appear to debunk the assumption that militant youths and violent communities are rewarded with projects and contracts. This reality in the Gbaramatu context, however, is inconceivable and atypical, which affirms Weiss et al.'s (2022) contemporaneous conflict dynamics. Ostensibly, one scenario, which supports and informs the assessment by the respondents, is the location and distribution of housing units built by DESOPADEC in Okerenkoko. Field observation and interviews (KII and IDI) revealed that the location of the housing units in the community was based on certain criteria such as being a victim of ethnic conflicts and military offensive, especially those whose houses were destroyed. According to Kingsley Otuaro, "the families who got housing units were those whose homesteads were destroyed during the ethnic violence (1997 – 2003) and military invasions of 2003 and 2009, and as such a housing unit was built on the same piece of land" (oral interview, 2018).

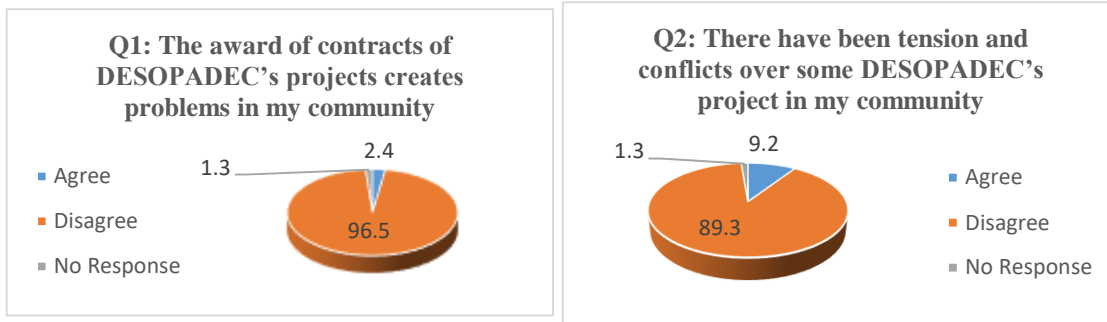
In practice, the award of contracts and location of projects remains a strategic measure used by government and multinational corporations to quell the most vocal and potentially-violent groups in communities. However, a reward system that is based on narrow identities, is a pointer to fragmentation of groups. For example, during the pilot study many youth leaders of other Ijaw communities observed that Gbaramatu area had benefited, more than any other community, from DESOPADEC's projects, appointments and programmes, not because of production quantum but as a hotspot of violent extremism and Ijaw resistance to government (oral interview). A perception of this nature could be an inducing factor that feeds into, creates and sustains micro-level conflict among Ijaw oil-bearing communities.

7. Introduction of New Conflict and Conflict Escalating Factors

There appears to be a consensus, among scholars and practitioners of development and peacebuilding, that development interventions in conflict zones have been known to generate, feed into existing conflicts and even create new conflicts. According to Bush (1998), development challenges traditional values or authority structure, increases the stakes in the realm of economic competition as well as creates new winners and losers. It is along this conceptualisation that the introduction of new conflicts by development interventions is explained in this cluster. Therefore, the extent to which development intervention creates new conflicts or generates conflict properties can be

explained in terms of how contracts for projects are awarded. It also includes how manpower engagement of outsiders, when concerned communities can provide local labour, non-payment of development levies, absence of community relations and engagement as well as attitude of project staff. Empirical evidence in a Delta-wide context suggests that the impact of isolation in contract awards and exclusion of local unskilled labour characterised community grievances and aggravated unemployment, leading not only to new conflicts (micro) but also an overt desire to join militia groups (macro).

Cluster 3: DESOPADEC's Projects and New Conflicts



Source: Fieldwork.

The combination of Q1 and Q2 consists of several matrixes of factors that reflect isolation and the ‘us and them’ thinking – a synonymous conflict driver with capacity for increased recruitment into militia group in the Niger Delta. Responses to the first question on the cluster showed that only a small percentage of respondents (2.4%) agreed that the award of contracts for DESOPADEC’s projects created problems in their community. However, this was not the view of over 96% of respondents who thought that the award of contracts for DESOPADEC’s projects was not a source of conflict in their community. To the second question, only 9.2% agreed that there had been tension and conflicts over some DESOPADECs projects in their community, 89.3% thought otherwise, while 1.3% did not attend to the question.

The aggregate responses in the cluster (Q1 and Q2) shows that 6% agreed, 92.5% disagreed while 1.5% of the respondents were silent on the questions. The low rate of agree response was ascribed to the fact that project staff were cautioned on their relationship with community members. For instance, according to the Chairperson of Oporoza Community, Emami Ebimene, “Project staff are warned during contractor’s pep talks to avoid sexual relationship with married women and underaged female community members” (Oral interview, 2014). Furthermore, to ensure social decorum, project staff were warned from embarking on alcohol drinking spree and smoking of Indian hemp. Such warnings, according to the leadership of the community, were necessary to nip in the bud behaviours that could generate micro conflicts (a story was told of a project staff, who was involved in making sexual advances to a married woman and how he was removed from the project site and the

community to resolve the conflict with her spouse). In this way, community efforts to evolved safety valves and mechanisms to minimise conflicts enhanced harmonious relationship between project staff and community members in the process of project execution.

Given the commission’s understanding of the aforementioned context, it vigorously pursues the policy and practice of developing local capacity and participation, by engaging local contractors as project partners for capacity-building and community empowerment. This is done essentially with principles to underscore a strong sense of participation and ownership, through a conflict-sensitive approach that guarantees proactive risk mitigation against project failure, insecurity and sabotage. However, from field observation, the commission appears not to take responsibility for community relations in project implementation, as the contracting policy implicitly states that contractors are responsible for their own community relations. In this context, various principles guide the execution of projects to ensure that the core values and benefits of interventions are maintained without creating new conflicts or escalating existing ones. The principles were derived from taking cognizance of the sensitive context and environment. It is obvious that these principles are not new to participatory development and effective peacebuilding practices, but provide dialogical space, inclusive of all views and strategic engagement with a wider set of people and stakeholders.

8. Motivation to Join Militant Groups / Taking - up Arms

Militant and violent youth activities in the Niger Delta arose from feelings of deprivation, inequality and inability to take advantage of employment and contract opportunities in the oil industry as host communities. Current thinking about militant and youth interference in development project implementation, in the Niger Delta region, underscores a criminal disposition. Arguably, the motivation to join armed/ militant groups is not to challenge marginalisation but an opportunity to access personal economic benefits through gang criminality. Therefore, the assumption here is that youths are attracted to enlisting as militants because of criminal financial gains, especially through coercion and intimidation of contractors of development projects in their locality. The iteration of youth interference and violent attacks on development projects create insecurity and apprehension for project partners, while also negatively affecting the intervention to improve the woefully-inadequate development infrastructure, as they often result in work stoppage.

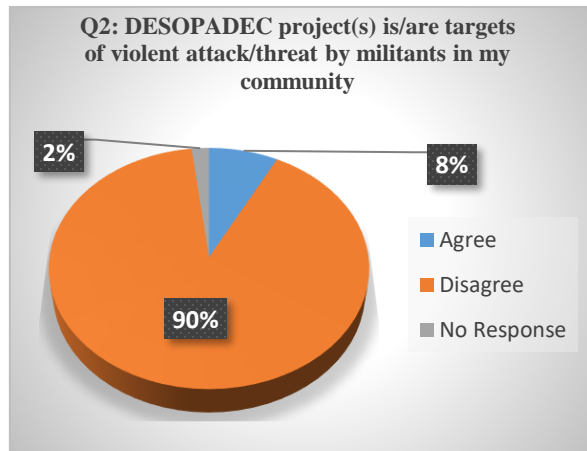
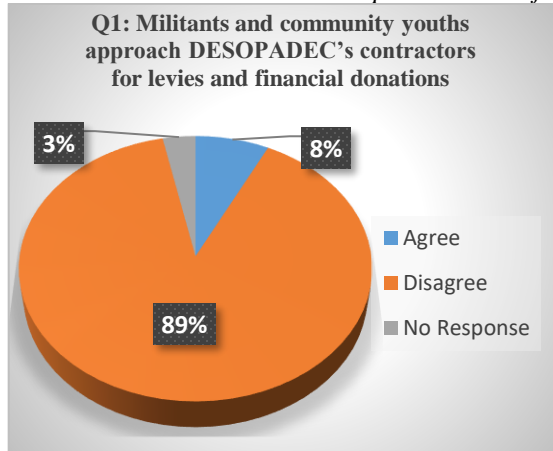
A common knowledge and orientation in the Niger Delta is that contractors working on any community development project should pay some kind of community administration levies (known as deve) to the community and the youth or militant leadership. Arising from any breach of this orientation, to pay prescribed community administration levies by any contractor, could lead to violent interference, disruption of operations and outright work stoppage. Field observation shows that the commission’s project partners are responsible for their community relations. It is against this background that three survey questions, in addition to other instruments, were used to elicit lived experiences on how militant and community youths’ interference in the execution of

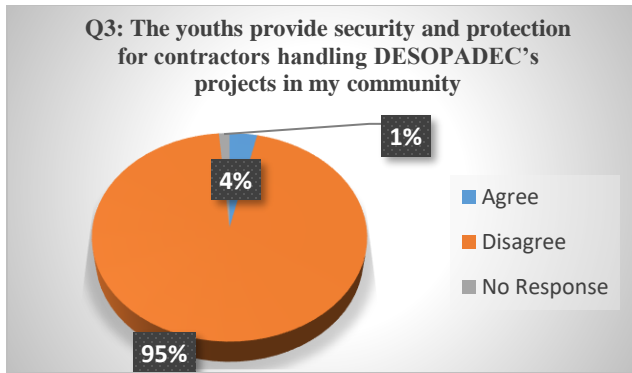
projects feeds into the insecurity in Gbaramatu Kingdom, as presented in Cluster 4.

Responses to the questions showed a level of consistency in the assessment of youths and militants’ interference in project execution. The negative effects of youth interference were marked by more of “agree and strongly agree” responses to questions 1 and 2. Expectedly, the “agree” responses to questions 1 and 2 (10% and 4% respectively) reflected the negative responses. This is due to interference, intimidation and extortion by militant/youth groups, targeted at contractors of development interventions. Conversely, the preponderance of the “disagree and strongly disagree” responses to questions 1 and 2 (89% and 94.4% respectively) reflected the positive disposition of youth/ militant elements to development interventions in Gbaramatu. Unlike the trend in other communities, the data shows that militants and youth groups had neither interfered with project execution nor had there been any incident of attack on contractors, irrespective of the donor organization.

The data suggests a positive communal disposition to attract, encourage and support infrastructural development to improve Gbaramatu communities. This could also be attributed to the pervasive conflict fatigue on the part of the community. However, it is imperative to point out that, from field observation, the only recorded case where the community did not support a development project, of 350 housing units, by the Delta State government after the military invasion of 2009, was in Okerenkoko community. The project was rejected and stopped on account of wrong housing models for a coastal community. The contractors used wood instead of a more durable brick or block walls.

Cluster 4: Militants and Youths Disposition to Project Execution





Source: Fieldwork.

The general view obtained from key informant interviews supports the data presented above. According to Apostle Haggai Maware (JP), community leader and spiritual head of Okerenkoko Zion, “the elders have often counselled the youths that any project that is coming into the community is for the benefit of all, therefore, they should, rather, assist the contractors and not cause any harm or disturb the contractors” (Oral interview, 2014). Evidently, the tendency for communities to support infrastructural development is reflected in the positive response to the last question in the cluster (86%). This is predicated on the desire for rapid infrastructural development. Therefore, the communities are poised to support any contractor or donor agency (not limited to DESOPADEC). To this end, the youths, as vanguards of security, are saddled with the security task of protecting the staff and the equipment of contractors. Less than 13% of respondents disagreed that youths provided security for contractors. This response could be ascribed to the fact that youths have often been responsible for breaching peace, stealing, and acts of mindless vandalism.

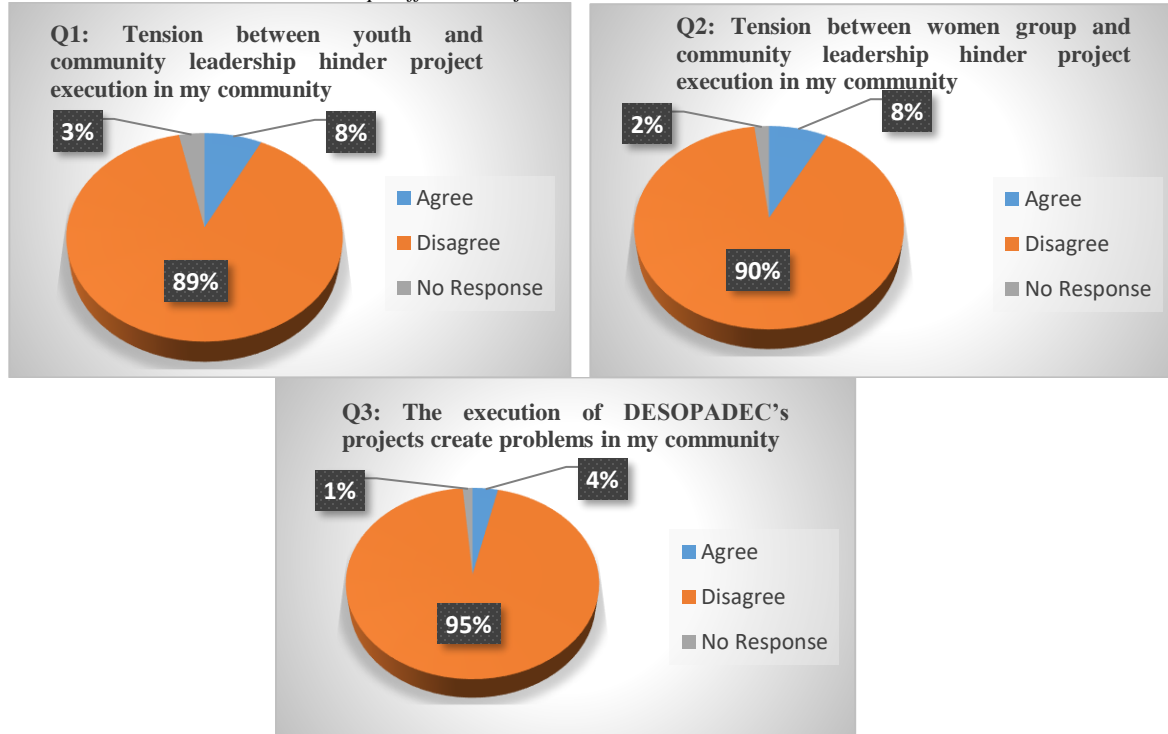
Responses to the questions in this cluster shows a level of cooperation and support for contractors handling projects in Gbaramatu communities, irrespective of the donor agency. The aggregate responses in the cluster show that 33.3% agreed, 65.4% disagreed, while 1.2% of the respondents were silent on the questions. The data suggest that Gbaramatu is atypical and the finding is not consistent with the pre-field assumption. This is because elsewhere in the Niger Delta, militants and violent youth groups use force to extort money from contractors to fund their activities. Furthermore, the study observed that the impact of the Federal Government’s twin interventions; namely, the presidential amnesty programme’s training and skill acquisition for ex-militants at home and abroad, and the oil pipeline surveillance contract to ex- militant leaders, had significantly contributed to the prevailing situation in Gbaramatu.

9. Division in the Community along Subgroups

A prevalent view of community leadership, in the conflict history of the Niger Delta region, is that individuals and groups have used community platforms to further personal agenda, at the expense of community interests where poverty and inequality are visible indices. This transactional community leadership tendency is the pivot on which distrust between members and community leaders, and youth violent behaviour revolves. This reality has continued to create conflict and problems in communities among subgroups (youths, women and elders) as well as engendered leadership tussle. The implicit assumption here, therefore, is that community leadership undermines the interest of other subgroups in the execution of DESOPADEC’s projects. This explicitly provides insights into the drivers of certain conflicts in the community.

Two critical subgroups – the youths and women’s groups in Gbaramatu communities were used to conceptualise how relations between subgroups and community leaders can hinder a development process. The youths constitute about 62.1% of the population in the Niger Delta (UNDP, 2006). They are full of energy and at the vanguard of security and community defence. The myriad of challenges confronting the youths are responsible for social disintegration and perhaps the attraction to join militant groups, as a means of survival. The womenfolk, though demographically computed to be 46%, is less than the male population of 54% (NDRMP, 2006), but they constitute a critical segment of the society. Women in Gbaramatu have been victims of ethnic conflicts and militant resistance struggle. The combination of Q1, Q2 and Q3 are intended, therefore, to analyse the vulnerability of different groups.

Cluster 5: How Tension between Groups Affected Project Execution



Source: Fieldwork

In the responses to the first question in the cluster, 7.3% of the respondents agreed that existing tension between youths and community leaders hindered the execution of projects in their community, whereas 89.2% disagreed. While a significant 3.2% declined response. Similarly, 7.6% agreed while 90.3% disagreed that tension between women and community leaders hindered project execution, and 1.9% did not attend to the question. Responses to the last question show that 3.3% agreed, 95% disagreed that project execution created problems, and only 1.3% were silent on the question. The data suggests that majority of the respondents (90%), in response to questions 1 and 2, believed that there was no tension between community leaders and youth/women groups that hindered the execution of DESOPADEC's projects. Only about 10%, in response to questions 1 and 2, contended that the execution of projects was hindered by tension between community leaders and youth/women. Their responses also depict that there were contentious issues but might not be significant enough to hinder the development process. The response to the third question further supports the response to questions 1 and 2 in the cluster.

The aggregate responses in the cluster show that 6% agreed, 92% disagreed while 2% were silent on the questions on tension between subgroups. The absence of tension between subgroups could be attributed to

two reasons. First, it was a popular belief that every development project implemented was for the common good of the community and it was incumbent on every member to support it. Second, the fulfilment of mandatory community relations and engagement obligation, by the contractor to every subgroup (community leaders, youths, women and the elderly), engendered trust. As Wariya Goodness Fany (Former Chairman, Gbaramatu Community Development Committee) noted:

Contractors must engage the women, youth groups and elders in the community just to abreast them with the fact that this kind of project is coming to the community with some little token to let them know that certain benefits are coming to the community. There are things (token) usually spelt out for the women, youths and elders of the community. So I don't think DESOPADEC projects have in any way caused disunity or disharmony in the area (Oral interview, 2015).

Evidently, the reduction of conflict dynamics in development interventions in conflict zones is a combination of factors including organizational policy and practice and commitment of all stakeholders in overcoming socio-economic and cultural barriers. In this context, the policy and practice of DESOPADEC and the community codes of Gbaramatu must seek to

locate and create opportunities to change conditions from which conflict dynamics emerge.

10. Conclusion

Infrastructural deficit and the socio-economic exclusion of oil-bearing communities from ‘mainstream development’” (*Niger Delta Human Development Report*, 2006:6) poses serious threat to sustainable peace in Nigeria’s Niger Delta region, accentuating the debate on the linkages between conflict and underdevelopment. The living conditions and visible alienation from socio-economic activities in the oil and gas industry in the region is germane to the culture of violent conflict. Notwithstanding, economic development and improvement, in terms of human capital and social infrastructure can be a major marker in assuaging the almost entrenched culture of violence that has emerged from underdevelopment, marginalisation and exclusionist tendencies. Within the context of causal – effects of the entrenched culture of violent conflicts in the Niger Delta, development and peacebuilding become symbiotic. This is because the development of the region, within peacebuilding paradigms, is capable, in a more appropriate way, of addressing the core causes of the conflict.

This study attempted a systematic assessment of the impact of DESOPADEC’s development projects on conflict dynamics against the backdrop of issues confronting development practice in the Niger Delta region. The patterns and potentials of development interventions in the Niger Delta have almost always manifested some inherent challenges and problems. While conflict-generating properties and factors such as violence, tension and insecurity may appear physical and tangible, peace-generating factors are abstract in nature. Arising from the research findings, indicators that were primarily designed to define the conflict impact of development interventions, turned out to be useful in explaining the intensification of peacebuilding impact in Gbaramatu communities as well.

Most DESOPADEC projects, like many other projects in the region, are not preceded by Peace and Conflict Impact Assessment (PCIA), unlike the Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Cost-Benefit Analysis (CBA) and Social Cost-Benefit Analysis (SCBA). Consequently, the negative impacts of major projects on the environment and lives of the people are hardly taken into account. Yet, such negative impacts constitute additional elements of gross underdevelopment, poverty, ecological degradation and disempowerment, which resonate with relative deprivation - a precursor to conflict.

Although, the findings of this study suggest context specific lessons, they can alter the conflict dynamics of development interventions in the region. Therefore, this study concludes that development interventionists should adopt strategies that are based on localised decision-making.

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An Appraisal of *Asiko Awa Youth* and Empowerment Narratives on OGBC 2 90.5 FM Nigeria

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Abstract. Radio is everywhere and remains a tool for youth mobilization in developing countries. It serves that need by reaching out to a specific group, class, or category of people. This study examined the effectiveness of *Asiko Awa Youth*, an indigenous radio programme from OGBC 2 Abeokuta, on youth empowerment and whether such a programme is capable of mobilising both literate and illiterate youths to become self-reliant. It also identified the contributions of indigenous radio programme to youth empowerment within a society. This study is anchored on Development Media Theory, which provides a rationale for how to use the media for the development of people in underdeveloped societies. Using Focus Group Discussions, data was collected from youths who are listeners to the programme. For proper representativeness, the participants included both male and female, white-collar and blue-collar jobs, and all educational levels. The study found that youths have achieved some level of empowerment through information provided by indigenous radio programme. In addition, indigenous radio programme positively impacts youths' attitudes toward culture, work, and school. The study recommends that indigenous youth programmes be used to mobilize the target listeners toward empowerment and development by educating and enlightening them about significant community issues. It also recommends a national media policy on the inclusion of indigenous language content targeted towards the youth for youth empowerment.

Keywords: Broadcasting, Indigenous Language, National Development, Radio, Youth Empowerment.

1. Introduction

The media industry has experienced continuous technological advancement in the 20th and 21st centuries. The growth of Information and

Communication Technology (ICT), especially the Internet, gave birth to digital media, which offers a vast array of opportunities for using the media to reach the public. Digital media opened varied channels through which the public could get information. It also allowed for the building of social relationships among people of different backgrounds and provided employment opportunities for the youth, in particular. In all these advancements, radio stands as the most accessible and affordable medium of mass communication in developing countries (Olumuji & Onabajo, 2022). As a mass medium, it is an effective tool for youth mobilization and the development of any society.

Radio is now heard everywhere: in taxis, in the countryside, on farms, in creeks, and at sea. It has remained people's companion and provides a link to the world. Regardless of a person's location at a given time, radio serves and meets the information need. Different phases of development in the media did not erode the relevance of radio to society (Danos & Turin, 2021). Its cost-effective characteristics make it more accessible and an effective tool for community mobilization. It is an effective medium for disseminating information to the audience in every setting. Radio serves that need by reaching out to a specific group, class, or category of people. It is used to reach artisans, (petty) traders, and even technocrats. Radio is also used to teach children, youths, adults, and the aged, both illiterate and semi-illiterate, as well as literate. It serves as a potent medium to sensitize and mobilize the citizenry towards achieving set developmental goals (Akanbi & Aladesanmi, 2014).

As a result of its wide reach and continued popularity, radio can be considered to be Nigeria's most important and most widely used mass communication medium. Its extensive reach much surpasses that of other mass

communication mediums and goes beyond illiteracy barriers. One of radio's main advantages is its ability to broadcast in native tongues; unlike newspapers, which require some level of literacy to read and comprehend their contents, or digital media, which requires an Internet-enabled device and technical know-how to learn its uses, radio does not require any level of literacy to understand its content. Radio programmes are available in a variety of languages, most commonly English, but occasionally native languages specific to the country or region where the radio is broadcast.

Broadcasting in an indigenous language will result in a better understanding of a programme compared to communicating in an official language. Adeyeye et al. (2021) affirm that communicating information on issues will be less demanding by utilising indigenous languages in media messages. Nigeria is a multilingual country with over 500 languages. Nevertheless, only a small number of these languages are national, regional, or state. Only Yoruba, Hausa, and Igbo are considered regional indigenous languages; the rest are local languages spoken by a small number of people in minority groups.

Asiko Awa Youth is an indigenous radio programme that airs every Sunday between 1:30pm and 2pm on OGBC 90.5fm in Yoruba. The programme is aimed at correcting the anomalies in the youth community. It is also aimed at improving the social, economic, political, and cultural lives of Nigerian youth around the world. Issues relating to youth are discussed, digging deep into vices and how youth can overcome them towards a better society in the language they understand.

The term "indigenous radio programmes" is used in this study to refer to development radio programmes that are produced in the various native languages spoken in Nigeria. These are languages other than the English language that are native to the people and mostly spoken by those who are within a given community. These radio programmes are produced and aired in the community's mother tongue and are capable of addressing peculiar issues in the community. Empowerment in this study refers to helping youths achieve self-sufficiency through information or education. An informed youth is an empowered youth.

The number of unemployed and illiterate youths in society is rising at an alarming rate. This high level of poverty and illiteracy is caused by youths' lack of skills, and this pattern encourages social vices that increase crime, conflicts, drug misuse, and street rascality or gang activity. While other societal issues

like prostitution, peddling, and early marriage are more particular to young women, these vices are primarily present among male youths. The National Bureau of Statistics (NBS) reported a 42.5 percent unemployment rate for 2021, confirming the existence and persistence of these issues. Worse still, most of the radio stations operating in Nigeria use English as their major language of communication.

Political and religious programmes in indigenous languages on radio have received so much attention. Youth programmes in indigenous languages, on the other hand, have yet to get the desired attention in scholarship. Therefore, this study seeks to ascertain whether or not indigenous radio programmes are successful in helping youths achieve self-sufficiency through information or education.

1.1 Objectives of the study

- Examine youth perception of indigenous radio programme.
- Determine the effect(s) of the indigenous radio program on the attitudes of youths toward work.\
- Identify the contributions of indigenous radio programme to youth empowerment.

2. Indigenous Radio Programme

Indigenous knowledge is a body of information which is characterised by specific standards, values, and mental constructs that structure and control people's lives and their world views (Mpofu & Salawu, 2020). The BBC's efforts to promote African indigenous languages cannot be overstated, as numerous African languages such as Hausa, Somalia, Swahili, Afaan Oromo, Amharic, Tigrinya, Igbo, and Yoruba have benefited. (Nwammuo & Salawu, 2019)

Tshabangu & Salawu (2022) aver that indigenous media use language peculiar to a particular community determined by geographical location and interest. Akanbi & Aladesanmi (2014) add that if particular information is to be passed across and appropriate language familiar with the people is not used, then such information may not reach the audience in an understandable manner. Language plays a major role in the usefulness of electronic media to the populace.

Radio's usefulness in bringing the desired changes and development to communities depends largely on the type of programme packaged. Most radio programmes, however, are not designed to bridge the knowledge gap between the elite and the masses, thereby relegating the role of the media to inform, educate, and enlighten the masses, especially the

youths who are the nation's future (Olumuji & Onabajo, 2022). Nwammuo and Salawu (2019) attest that the use of local dialects in broadcasting, particularly radio, to broadcast information is better and can produce the anticipated outcome more than any other media. This puts radio ahead of other media in development communication.

Radio programmes in indigenous languages should be created specifically to teach youths how to find profitable employment and become contributing members of society. Such programmes will discourage vices and explain to them the many advantages of being creative, diligent, and informed. It is said that an idle hand is the devil's weapon.

Radio (programmes) should be a source of progress and a means of combating underdevelopment; these development programs can be broadcast in indigenous languages to reach the illiterate and rural dwellers. Successful indigenous radio programmes usually appeal to the interests and tastes of the target audience (Olumuji & Onabajo, 2022). Salawu (2019) advocates for the development and sustenance of African indigenous media content. Communicating in indigenous languages improves social attachment and encourages acceptable and participation (Adeyeye, 2021).

It is safe to say from the forgoing that people's exposure to the media influences how they form their cognition, attitudes, and behavioral patterns. The media played, and will continue to play, a significant role in influencing how people perceive the world and how they behave. This study will lend credence to the idea that because indigenous programmes on radio address listeners in their mother tongue, non-literate English speakers have a favorable opinion of them. But it's not clear whether that impression always results in a shift in their attitude.

Radio and youth empowerment

A nation's level of development is directly correlated with its level of empowerment. The ability of a developed country to increase empowerment through information and job creation for the majority of her population appears to be what separates her from a developing or underdeveloped country (Ayeeni et al., 2021).

Every country's youths are thought to be her most energetic and engaged group, making them one of its greatest assets. They are the backbone of any community and, in addition to being rightfully recognized as the next generation of leaders, they represent both the greatest potential and actual investment in the advancement of a nation. Therefore, a programme like *Asiko Awa Youth* aims to refocus the

attention of young people in Ogun State and its surroundings on education and skill development for community development. Therefore, any indigenous radio programme addressing the problem of how to best harness the energy of youths for empowerment and development must actively engage the youths.

Since youths appear to be the most affected demographic when it comes to unemployment, most nations strive to concentrate on initiatives and programmes for youth empowerment in the belief that this will have a significant impact on job creation. The idea of empowerment has traditionally been applied to the creation of new jobs, which Ayeeni et al. (2021) argued as not always leading to unemployment in other sectors as a result of the jobs already generated. In order for young people to be gainfully employed, there is a need to give more attention to the informative component of disseminating these opportunities to youths who need them in both rural and urban centres. Again, the use of radio and radio programmes to fill the communication gap comes to the fore – which is the purpose of this study– to help youths achieve self-sufficiency through information or education.

Radio can be used not only to inform and educate the people, but also to mobilize them to participate effectively in a development process. By doing so, the illiterate and the majority of people living in poverty can be reached with the information they need to empower, educate, and ultimately close the development gap between Africa and the rest of the world (Olumuji & Onabajo, 2022). But Mpofu and Salawu (2021) lament that radio stations have relegated their role as a social function of the cultural industry. They have taken to the production of content that enhances revenue generation through attracting audiences and advertisers.

Nwammuo and Salawu (2019) aver that radio programmes can be useful for improving knowledge because they have an exclusive impact on the process of learning. The use of indigenous media content shared on digital platforms can attract young audiences who are frequent users of social media (Tshabangu & Salawu, 2022).

In addition to being a great tool for mobilization and motivation, radio has the capability to inform its broad audience to innovative approaches, methods, and even the most recent ideas that require urgent public attention. Even community workers can attest to the effectiveness of indigenous radio programmes in motivating people to support development. The regular immunization programme comes to mind as one such. The level to which such communication is

based on knowledge of the society's culture, particular system of values, and attitudes will affect the effectiveness of such programme message. This demonstrates unequivocally that a programme that is packaged with the language and cultural norms of the target audience's immediate environment in mind will be best suited in effecting any desired change.

The trending notion that radio programmes should largely focus on entertainment, religious and political matters, has led to the paucity of programmes on youth empowerment and development (Olumuji & Onabajo, 2022). Radio meets these criteria because newspapers are predominantly published in English (Adeyeye et al., 2021). The radio can be used to launch an empowerment campaign targeted at the youths, and such a campaign will be more effective if it is done in the indigenous language of the people.

3. Theoretical scaffolding

A justification for media use in the development of rural or undeveloped societies is provided by Development Media Theory. The Development Media Theory was put up by Dennis McQuail in 1987 to offer a justification and plan for using mass media to advance and assist underdeveloped nations worldwide. The United Nations Economic Scientific Cultural Organization (UNESCO) MacBride commission, which was established in 1979, is credited with giving birth to the notion. The idea aims to explain the press's normative behavior in developing nations. According to Asemah (2011), the media can aid in the process of development in poor nations. He added that the media are viewed as facilitators of social change and development.

The guiding principles of the theory, according to Anaeto, Onabajo, and Osifeso (2008), are that the media should accept and complete responsibilities that will positively advance society in accordance with stated national policy. The media should prioritize using the indigenous language and culture in their content. Technology coexists with the culture it influences, and similarly, dramas and other broadcast programmes are made with those countries' cultural backgrounds in mind. The media should prioritize connecting with other countries that are close to them culturally, economically, politically, or geographically while reporting news and providing information. Journalists and other media professionals are free to obtain information, but they also have obligations.

The theory is anchored on communication for development, which sees the mass media as ready to champion the social, economic, and political

developments of developing nations. The use of the development media theory in this study will show how indigenous radio programmes on youth empowerment can be used by the media to mobilize youths to become self-sufficient, thereby complementing and assisting the government to achieve its plan of reducing unemployment, especially among youths.

4. Methodology

The study is a qualitative study that adopted an interpretive research paradigm to understand youth empowerment via indigenous radio programme (Mpofu & Salawu, 2021). Data for this study was collected from FocusGroupDiscussion of youths who are listeners to the programme. Using FGD provided us with a unique opportunity to interact with the programme's audience and obtain first-hand information. Two FGDs with eleven participants each were conducted, and to improve the representativeness of the participants, we ensured that the characteristics of the listeners included both male and female participants, white-collar and blue-collar jobs, as well as participants of different educational levels.

For ethical consideration, eligible respondents were given a chance to comprehend the study's goals and ask questions about the research and participants' rights, and they gave their consents to join the FGDs. Participation in the FGD was voluntary. Participants were not required to disclose their names or any other traceable identity to ensure that their responses could not be traced back to them. The discussion-building technique was used as the method of data presentation. In using this technique, the researcher elicited responses derived from the FGD with the aim of interpreting and extracting meaning from the answers (Nwammuo & Salawu, 2019). Data were analysed thematically in relation to the study's research questions.

5. Youth Perception of Indigenous Radio Programme

The responses from the FGDs revealed that *Asiko Awa Youth* programme is interesting, and the majority said the vox pop and advice segments of the programme were the most interesting parts of the programme. Both FGD groups confirmed that the use of indigenous languages for a youth programme is a good initiative because it will give the programme more acceptance as not every youth understands the English language, and this generation of youths are fast losing touch with their cultural heritage. Here are some of the FGD responses:

FGD 1: to reach these large number of people, the indigenous language is prescribed. There's also the belief that the Yoruba Language is gradually fading away especially among we the youths, which is why some radio youth programmes should be aired in the local language

FGD 1: Using indigenous languages would increase audience participation because not every young person is educated enough to speak English.

FGD 2: The use of indigenous languages to broadcast can ensure continuous transmission of culture, customs, and history

FGD 2: I would prefer a programme where a particular language is chosen, rather than mixing two languages.

This finding supports Akanbi and Aladesanmi (2014) submission that the language employed by a media house goes a long way in determining the listenership strength and effectiveness of its services. The use of language in a broadcasting programme should be in tandem with the set objectives of the programme, the targeted audience, and the language of communication in such a locality. Audience tend to bond more with programmes that reflect their roots or origins. Here are more responses that support the use of indigenous language:

FGD 1: The episode about greetings in Yoruba culture was the most interesting.

FGD 2: We will feel more connected to our roots if radio programmes for youth are broadcast in our native tongue. Most youths just know their names and have no idea of their origins

The responses of FGDs align with Danos and Turin(2021) that indigenous radio serves as a tool for reclamation and maintenance of indigenous languages, particularly if the programme teaches basic knowledge and etiquette about the culture of the people. Indigenous radio programs provide youths who otherwise would not have the opportunity to learn about their culture.

Indigenous language radio programmes are a welcome addition to the idea of promoting native language for indigenous people who live in primarily rural areas because they enable effective communication among the indigenous groups and allow their value systems to permeate within the localities.

6. Indigenous radio programme and youths' attitude to work

There was a consensus among the participants of the two Focus Groups that the programme *Asiko Awa Youth* had greatly impacted the youths' attitude toward work and how they view the world at large. They also

mentioned that the program had improved their attitude toward academics for participants who were still in school. Here are some excerpts:

FGD 1: The episode dealing with dealing with "yahoo-yahoo" helped change my attitude toward making quick money and following legitimate methods.

FGD 1: The programme has helped change some negative attitudes of the youths, especially when advice is given towards the end of the programme to imbibe positive virtues in academics and work.

FGD 2: The choice of Yoruba language makes it explicit to both literate and illiterate that being an apprentice and becoming your own boss in the future is the solution to poverty.

FGD 2: Everyone in this room will agree that this indigenous program has improved their attitude toward work and academics for those of us who are still in school.

The finding that indigenous radio programmes have the potential of influencing youths' attitudes toward work positively aligns with Adeyeye (2021) submission, that communicating in indigenous radio programmes brings about productivity. Radio programming in indigenous languages appeals more to the conscience of youths, especially if it is to motivate them to work. This also validates the Media Development Theory, which holds that radio can be used for campaigning and advocacy in changing people's attitudes toward work and contributing to national development in their own small way.

Moreso, for a developing nation like Nigeria, all hands must be on deck, and the youths constitute the largest part of the workforce for national development. Proprietors, programme sponsors, content and programme producers have to be more intentional about the use of indigenous language in broadcasting. More indigenous language radio programmes should be produced expressly to instruct youths on how to find rewarding employment and become contributing members of society. These programmes will educate viewers about the various benefits of creativity, diligence, and knowledge while discouraging vices.

7. Contributions of indigenous radio programme to youth empowerment

Findings from the FGDs revealed that youths have achieved some level of self-sufficiency through information and education provided by *Asiko Awa Youth*. This affirms that an informed and/or educated youth is an empowered youth. Here are some of the FGD responses:

FGD 1: Knowledge gained from the programme has made youths more self-reliant and

FGD 1: The program has opened my eyes to other productive vocational skills such as fashion, make-up, and textiles (Adire) that will help me become self-sufficient.

FGD 2: I have learned to be self-reliant, respectful, and well-behaved

FGD 2: The program has encouraged young people to be gainfully engaged in vocational skills rather than waiting for white-collar jobs, and young people can venture into entrepreneurship.

Youths affirmed that Indigenous radio programme has met their information needs; this finding corroborates Olumuji and Onabajo (2022) position that the media, as the fourth estate of the realm, if given space in broadcasting radio programme will aid youth empowerment for national development. The nation needs youths to be part of her development hence the need to garner their input through the media with the use of indigenous programmes in order to reach the youths at all levels and locations, as no nation can develop without her youth's resourcefulness. It is also in tandem with Danos and Turin (2021) suggestion that indigenous and non-indigenous communities alike should take advantage of the transformative and creative roles the radio plays in the development of society. Ayeni et al. (2021) avers that the radio can be used to focus more on the informational aspect of providing these chances to youths who need them in both rural and urban centers if we want young people to be gainfully employed.

The target audience is essentially engaging in the programme and the growth of their communities when they are given the opportunity to talk about their circumstances and solutions for improving them. This type of engagement may take the form of audience suggestions beginning with the programme implementation stage, throughout the programme, or during programme evaluation in the form of phone calls for feedback. *Asiko Awa Youth* airs for 30 minutes, however, we discovered that no one calls in or sends messages during that time because it is a recorded programme. This is a limitation for this programme that is also peculiar to other recorded radio programmes. Live programming enables instant feedback and audience involvement. Live programmes allow for immediate feedback and participation in the programme. It suggests that the programme is reaching the intended audience and that there is hope for a desired outcome when a program is created in a way that will encourage participation from the target audience.

Successful indigenous radio programmes typically need to capture the attention and taste of their intended

listeners. A fundamental tenet of the Development Media Theory states that programmes with a large audience are more likely to have a significant impact on audience loyalty, which may lead to involvement and eventually a change in attitude or behaviour.

Therefore, the idea of indigenous programmes goes beyond simply creating excellent radio programmes in native language. Through these programmes, important topics for the community, like ideas for generating income and strategies for enhancing education, are also covered.

8. Conclusion and Recommendations

This study concludes that OGBC 90.5FM's conception and broadcast of *Asiko Awa Youth* is a positive step toward youth empowerment through indigenous language. It has positively impacted youths' attitude to work and school. But OGBC and other broadcast stations alike will write their names in gold if they invest more in empowerment ideas and air more youth-oriented programmes in indigenous languages in order to reach more rural dwellers, artisans, and illiterate and semi-illiterate youth.

Based on the findings of the research, it is recommended that:

In order to promote indigenous culture to a global audience, there is a need for a national policy on the institutionalisation of indigenous languages in broadcast programmes especially in radio targeted to youth. Radio stations should devote a certain percentage of programmes to broadcasting in indigenous languages. By so doing, there will be a revitalization of national consciousness on the need for youths to promote their indigenous culture; and local radio stations like OGBC 90.5fm have the potential to have a significant impact on young people's lives in their respective states. These radio stations should be intentional about influencing young people to modify or strengthen existing characteristics because they are familiar with the community in which they work and can speak to its residents in their own language. Local and national radio stations should use indigenous youth programmes to mobilize the target listeners toward empowerment and development by educating and enlightening them about significant community issues. Youth is one of the most untapped growth drivers. The time has come for the government and other stakeholders to either focus on youth development and enjoy significant developmental gains, or to do otherwise at the risk of the country.

For greater impact on youth empowerment, more interviews of successful entrepreneurs, especially those from humble beginnings, should be aired. Future episodes of the programme should focus more on skills, craft, and blue-collar jobs.

In addition, the programme episodes should be shared with youths on different social media platforms; so that more youths would listen to them and be empowered for their own and national development.

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Human Resource Policies, Decision Making and Industrial Harmony in Edo State

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Abstract. This study empirically assessed the relationship between human resource management policies and decision making in promoting industrial harmony in Ministry of Finance and Ministry of Budget/Planning in Benin City, Edo State. The study specifically examined how human resource policies (promotion and transfer policies, leave and time-off policies, employee conduct policies and employee exit policies) influences industrial harmony ad decision making and how decision-making influences industrial harmony in Ministry of Finance and Ministry of Budget/Planning in Benin City, Edo State. Cross-sectional survey research design was utilized in this study. The population of this study consist of all one hundred and seventy-five (175) staff of the Ministry of Finance and Ministry of Budget/Planning in Benin City, Edo State. A sample size of 122 respondents from the Ministry of Finance and Ministry of Budget/Planning in Benin City, Edo State were administered questionnaire. Data collected were analyzed using descriptive statistics to ascertain the employees' perceptions on the variables of interest while Pearson correlation coefficients and multiple regression analysis were used to analyze the relationships among the research variables. All tests were performed at a 5% level of significance using SMART software. The structural equation modeling (SEM) was used as the estimating technique to analyze the structural relationship between measured variables and latent constructs. The study found that human relations policies positively impact on industrial harmony in an organization. The study found that there is a statistical significance between human resource policies, decision making and industrial harmony. It is recommended that management need to improve the level of job involvement of employees in the decision-

making process, especially those human resource policies that affect them as this would eliminate any form of discrimination to a minimum.

Keywords: Human resource management policies, Decision making, Industrial harmony, Promotion and transfer policies, Leave and time-off policies, Employee conduct policies and Employee exit policies

1. Introduction

The workplace is made up of various values, convictions, and behavioral attitudes held by both employers and employees. Employees are the heart of any business and play an important role in driving growth and profitability (Asamu, Abiola, Ogadimma, and Bamidele, 2019). They are also the engine that drives any organization. However, a strong union (industrial harmony) between workers and the organization managers is necessary for workers to perform effectively and efficiently (Chen, Chen & Chen, 2018). Nevertheless, Tom and Shepherd argued that industrial disharmony is inevitable because there are inherent competing interests, whether in wages or terms and conditions of service for workers. This is true regardless of how social elements relate to one another in work organizations.

Workplace conflict, according to Idemobi, Ngige, and Ofili (2017), occurs when the interests, goals, or values of various people or groups are incompatible, making it difficult for each person or group to successfully accomplish their goals within an organization. Industrial harmony is the relationship between management and employees regarding the terms and conditions of employment and the

workplace, according to Dickson and Biriowu (2020). In essence, it is a circumstance in which management and staff voluntarily work together to further the goals and objectives of the company. According to Onimole, Akinseye, and Adebuseye (2020), one of the main elements of interventions for promoting industrial harmony in organizations is the use of human resource management policies and decision-making. Usman and Dugguh (2014) noted that since people produce all other organizational resources, they are the most valuable organizational asset.

Therefore, it is important to manage human resources well to support the achievement of organizational goals. Usman and Dugguh (2014) provided support for the idea that managing human resources involves an organization's capacity to hire, develop, reward, and manage staff to boost overall productivity. According to Irfan and Robina (2013), organizations cannot afford to lose potential human resources in this competitive age. Corporate organizations spend a lot of money on attracting, developing, and inspiring competent staff because they cannot afford to lose their talented employees. Who also participate in decision-making.

According to Ezeanolue and Ezeanyim (2020), decision making is all about creating an enabling environment in which individuals can have an impact on actions and decisions that influence industrial harmony. According to Shrestha, Ben-Menahem, and Krogh (2019), "decision making process is a workplace approach designed to ensure that employees are committed to their organization's goals and values, motivated to contribute to organizational success, and are also able to enhance their own sense of well-being at the same time. According to Oyebamiji (2018), "decision-making has been recognized as a managerial tool for improving industrial harmony by pursuing the shared objectives of employees and managers. According to Pillay and Singh (2018), encouraging positive decision-making processes will improve industrial harmony and help organizations stay competitive in the rapidly expanding business environment.

Effective administration of human resource management policies and employee decision making is essential to guaranteeing a promising and feasible potential for their establishment (Adekoya, Jimoh, Okorie & Olajide, 2019). Adekoya, Jimoh, Okorie and Olajide (2019) acknowledged that "a highly engaged workforce can increase innovation, productivity, and bottom-line performance and thus enable employees to be committed to the organization, which in turn promote industrial harmony. More so, empowered

employees through effective human resource management policies are said to be in the position to make quick decisions and respond to any changes in the environment.

Studies on human resource management policies, decision making and industrial harmony have been respectively investigated empirically in both developed and developing nations, for example; Onimole, Akinseye and Adebuseye (2020), Dickson and Biriowu (2020), Ezeanolue and Ezeanyim (2020), Asamu, Abiola, Ogadimma, and Bamidele (2019), Oyebamiji, (2018), Idemobi, Ngige and Ofili (2017), Usman and Dugguh (2014), among others. This study intends to align its research to businesses in Edo state, which have not been undertaken. There is a high amount of dearth in empirical literature on the study of the impact of human resources policies and decision making on industrial harmony in Edo State as most studies tend to investigate these variables independently.

This study is earmarked to evaluate the impact of these three variables on each other using structural equation model to identify the degree of influence of human resource policies on industrial harmony, human resource policies on decision making and decision making on industrial harmony.

Against this backdrop, the following research objectives were raised:

- To empirically assess human resource management policies and decision making in promoting industrial harmony.
- To examine the impact human resource policies (promotion and transfer policies, leave and time-off policies, employee conduct **policies and employee exit policies**) has on industrial harmony;
- To investigate the impact human resource policies (promotion and transfer policies, leave and time-off policies, employee conduct **policies and employee exit policies**) **on decision making; and**
- To ascertain whether decision making influences industrial harmony.

2. Literature Review

2.1 Industrial Harmony

Industrial harmony refers to a friendly and cooperative agreement on working relationships between employers and employees for their mutual benefit (Otobo, 2005; Osad & Osas, 2013). According to

Bassey, Ojua, Archibong, and Bassey, (2012) industrial harmony is a state of relative peace in any industrial organization, which involves; absence of strikes, and distrust among work groups or unions, peaceful relationship between unions and management of the organization, as well as employee positive perception of his or her contribution as participant not as subject within the organization. Industrial harmony is a very critical factor of organizational productivity and performance.

Barbara, Amah, and Okocha (2021) understudied how human relations affect the peace and harmony of an organization and concluded that human relations require having positive interactions among members of the team, to achieve industrial peace and harmony in an organization.

2.2 Factors Influencing Industrial Harmony

The industrial harmony system of an organisation is influenced by a variety of factors and these interrelated and interdependent factors determine the texture of industrial harmony in any setting. In fact, they act, interact, and reinforce one another in the course of developing the industrial relations. Some of these factors as stated by Mirza (2020) include: institutional factors such as state policy, labour laws, collective bargaining agreements, labour unions etc. Economic factors such as the form of economic organisations, domestic or MNC, the source of labour supply, disparity of wages between groups, level of unemployment, etc. Social factors consist of items such as like social group, social values, norms, social status etc. Technological factors include items like work methods, type of technology used, rate of technological change, R&D activities, ability to cope with emerging trends, etc. Psychological Factors include owners' attitude, perception of workforce, workers' attitude towards work, their motivation, morale, interest, alienation; dissatisfaction and boredom resulting from man-machine interface etc. These factors considerably influence the patterns of industrial relations.

2.3 Industrial Harmony Strategies

Strategies to ensure industrial harmony in organizations differs but are all aimed at averting conflicts and ensure to smooth resolve of conflict whenever it arises. Some of the strategies include:

2.4 Individual Focused Strategies

(a) Increasing awareness of the sources of conflict: This is recognizing the forces responsible for conflict

and making individuals or team members aware of them so that they could avoid them (Dunnette & Hough, 1992).

(b) Increasing diversity awareness and skills: Organizations are made up of people from different ethnic groups and nationalities. Members have different skills by reason of differences in training and education. Therefore, managers should create this awareness so that members should learn to accept one another and work harmoniously together

© Practicing Job Rotation: Sometimes, conflict could arise because some individual organizational members simply do not have a good understanding of the work activities and demands that members from other units and department have. This lack of broad-base knowledge in the organization could be responsible for conflict among members. In situations such as this job rotation which could expand organizational members' knowledge base and appreciation of their units and department can be a useful way of resolving conflict (Wall, 1995).

(d) Using Permanent Transfers or Dismissals When Necessary: Sometimes when other conflict resolution strategies do not work as expected, managers may need to take drastic steps, including permanent transfers or dismissals of the conflicting members (Shapiro, Tracktenberge & Landro, 1995).

2.5 Organization Focused Strategies

(a) Changing an organization's structure or culture: Incessant conflict can signal the need for changes in an organization's structure or culture. Sometimes, managers can effectively resolve conflict by changing the organizational structure they used to group people and tasks. (Lawrence, Barnes & Lorsch, 1976). On the other hand, managers may sometimes need to take steps to change an organization's culture in order to resolve conflict. Norms and values in an organizational culture might inadvertently promote dysfunctional high levels of conflict that are difficult to resolve. In such cases, organizational culture may need to be changed to make conflict resolution easy (Bahar, 1995).

(b) Altering the source of conflict: When conflict is due to over-lapping authority, and status inconsistencies, managers can sometimes effectively resolve the conflict by directly altering the source of the conflict such as overlapping authority, evaluation or reward system, or status inconsistency.

2.6 Factor that Undermines Industrial Harmony in Organizations in Nigeria

In industrial relations, the main focus in the study of management is man, with the satisfaction of human

wants being the principal aim of all economic enterprise. Whenever this is ignored, industrial relation tends to be strained, ending up in industrial conflict (Bankole, 2000). Nwokocha (2015) noted that leadership behaviour, lack of effective communication, work environment, and non-recognition of trade union as a bargaining party results in conflicts in organizations. These factors are examined below:

2.6.1 Leadership Behaviour

Leadership behaviour is a potent tool in managing employee/employer relations in workplace. Employees in the organization need leaders to guide them towards the attainment of the goals and objectives, both of the individual and the organization (Ushie, 2002). Leadership is essentially a process in which one individual or sometimes a small group of individuals influence the efforts of others towards the achievement of goals in a given set of circumstance (Cole, 2005). Iheriohanma (2009) sees leadership as the ability of a person to lead. He posits that leadership functions within the contexts and situations. For instance, in Nigeria, Bankole (2000) and Gordons (2013) noted that an autocratic leadership style will definitely breed a conflict atmosphere that might lead to less innovation and employees' morale. These assertions imply that the leader must have a good sense of human relations and adopt approaches that will lead to the attainment of the stated goals and objectives of the organization and the needs of the individual employees at work.

2.6.2 Effective Communication

Communication is vital to any social system as it creates an environment of trust, harmony and proficiency. It is essential to worker's involvement so as to boost mutual understanding between management and employees and enhance organizational performance and productivity (Akpojovwaire, 2013). Onimole, Akinseye and Adebusey (2020) assert that most organization conflicts and industrial disharmony result from lack of knowledge and proper understanding of the facts due to inadequate or complete absence of communication. Likewise, Onyeizugbe, Aghara, and Olohi (2018) found that joint consultation and employee engagement influence industrial harmony.

2.6.3 Work Environment

Work environment is generally discussed from the industrial (physical) and psychological perspectives as factors that play significant role in employee's

disposition at workplace. The physical aspect of work environment consists of noise, toxic substance exposure and heavy lift etc. (Hytter, 2008), while the psychological dimension consists of work-load, decision, support, stressor, latitude etc. (Muhammad & Fahad, 2013), work-life imbalance, status and role adjustment problem, etc. (Austin-Egole, Wokoma and Iheriohanma, 2014).

2.6.4 Non-Recognition of Trade Union as a Bargaining Party

Okene (2008) argued that the issue of recognition of the role of trade unions is crucial to the whole process of collective bargaining in industrial relations, especially as the Nigeria labour law gives recognition to trade unions for collective bargaining purposes. Collective bargaining is a means of joint regulation by employees and worker representatives. It offers the actors in industrial relations the opportunity to formulate rules by mutual consent (Venkata, 2011). It is an important channel for attaining a harmonious relationship between workers and their employers (Okene, 2010).

2.6.5 Breach of Collective Agreement

Nigeria as one of the market economies has witnessed industrial actions as a result of management's breach of collective agreement reached with trade unions. Albert and Yahaya (2013) aptly stressed that the source of trade dispute is as a consequence of failure of employers to respond to and respect existing agreement entered into with workers' representatives. Sholokwu and Owori (2016) argued that by implementing collective agreement, reducing casualization of staff and to develop a promotion policy, to fewer incidences of strike and grievances, industrial harmony can be achieved. In support of this view, Okene (2008) posits that the cause of industrial disharmony in organizations in Nigeria is non-enforcement of collective agreements. Chakraborty and Biswas (2021) noted that organizational trust and infusing a tolerant attitude toward conflict in a firm has been instrumental in instilling a sense of harmony and peace in one's mind and spirit. Such an ambience would generate a sense of participation, cooperation and would mutually reinforce social exchange.

2.6.6 Decision Making

Making decisions by managers is one of the most important elements of resource management, achieving short-and long-term goals, as well as for deciding on the success or failure of any venture (Kozioł-Nadolna, Katarzyna, & Wiśniewska, 2020).

Daft (2008) defined decision making as the process of identifying problems and opportunities and then resolving them. It should be emphasized that decision-making occurs at every level of management, and concerns both the top management and all employees in the organization.

Obi and Agwu (2017) claim that effective decision-making impact's organizational goal achievement.

3. Human Resource Policies

The Human Resource function include a variety of activities, and key among them is deciding what staffing needs an organization has and whether to hire staff on contract basis or regular basis to address the needs, recruiting and training the employees, ensuring they are high performers, dealing with performance issues, and ensuring that the organization's personnel and management practices conform to various regulations that are in force. Activities also include managing approach to employee benefits and compensation, employee records and personnel policies.

Human resource (HR) policies are rules and processes that govern the employment relationship between employees. HR policies describe the rights, responsibilities, and expected behaviours of both you and your employees when it comes to working together. An organization's human resources team is often responsible for creating and maintaining HR policies. Most HR policies apply to all permanent, temporary, part-time, and full-time employees within an organization

3.1 Forms of Human Resource Polices

Several policies and practices of Human Resource exist and some of which was discussed here in consonance with the objective of this work. HR policies may exist as written policies, as digital and/or printable policies, and in locations that are easily accessible by employees (e.g. company intranets or shared drives). They are often found in employment contracts, employee handbooks, and company policy manuals. However, the level of detail in each of these will vary (Gibbons, 2021). These policies include: Promotion and transfer policy, Leave and time off policy, Employee conduct policy and Employee exit policy.

3.1.1 Promotion and Transfer Policy

Promotion is an adjustment in status, upward coming about because of task to a position relegated a higher pay grade. Promotion is the progression of employees' position in an authoritative pecking order. Promotion

could be seen as employees' prize for good execution or positive action. Management in an organization elevates an employee to a specific position, it guarantees that the individual can deal with the additional duties by screening the worker with meetings and tests, and giving them preparing or at work experience. (Mirza, 2003).

The aim of promotion policy will include the following: to guarantee that all administration positions are kept an eye on by work force having the imperative capabilities, introduction and ability. To incorporate the desires for development and improvement of officers with the present and future necessities of the corporation. To guarantee value, reasonableness and objectivity in matters identifying with advancement.

3.1.2 Leave and Time-off Policy

An attractive employer-sponsored benefits program makes it easier for organizations to retain and attract great employees. According to the Society for Human Resource Management (2008) Job Satisfaction survey report, employee benefits are one of the most important job satisfaction factors for employees. Leave and other employee benefits are important tools in the retention efforts for the current and future workforce. Leave benefits encompass paid and unpaid time off from the workplace for a variety of activities ranging from vacation and sick leave to bereavement leave and jury duty (Society for Human Resource Management, 2008). Employee Conduct Policy Ethics codes are as old as antiquity. They often capture a vision of excellence, of what individuals and societies should be striving for and what they can achieve. When applied to certain classes of people: public servants, doctors – codes are the ultimate terms of reference. They are the framework upon which professions are built. Employee conduct covers issues bothering on harassment, sexual harassment, conflict of interest, confidentiality and non-disclosure, working hours and dress code.

3.1.3 Employee Exit Policy

The purpose of this policy is to outline the ways in which a working relationship can be terminated either by the employer or employee and to lay out the procedure on how exits from the organization will be managed. Exits deal with resignations, terminations, retirements, completion of fixed-term contract and dismissal. In Nigeria, termination of service can only be carried out in case of gross misconduct or negligence from the staff member and disciplinary action is adequately carried out resulting in termination of employment. Similarly, the service of

an employee may be terminated as a consequence of restructuring, job elimination, and economic downturns in funding or lack of work. All benefits associated with such terminations will be provided to the employee.

After critical review of literature, the following hypotheses were developed and stated in null form as:

H₀₁: Human resource management policies have no significant impact on industrial harmony

H₀₂: Human resource policies (promotion and transfer policies, leave and time-off policies, employee conduct policies and employee exit policies) have no significant impact on industrial harmony.

H₀₃: Human resource policies (promotion and transfer policies, leave and time-off policies, employee conduct policies and employee exit policies) have no significant impact on decision making.

H₀₄: Decision making does not impact on industrial harmony.

4. Theoretical Framework

This study was based on two theories: the human relations approach and the guest model. The human relations approach views human as people with feelings that have expectations in workplace. This approach provide an advantage for both manager and employees to act rightly in all situations. Also, making the right decision is related to the internal and external factors on how people perceived the behaviour of themselves and other people. With the guest model organizations can achieve high employee performance, stronger problem solving, reduce employee turnover, achieve greater goals and improve cost in an effective manner by adopting a coherent strategy of human resource practices properly integrated with the business strategy (Marsden, 2002). Thus, having the appropriate human resource policies or approach is essential in improving employee performance and effective decision-making.

5. Methodology

This section describes the research design, population, sample and sampling techniques, the research instrument, operationalization and measurement of variables, model specification, sources of research data, and the method of data analysis.

5.1 Research Design

Saunders et al., (2007) defined a research design as the means intended to conduct the work. The survey research allows for a sizeable amount of reliable data to be collected as it involves the sampling of representatives of the population to proffer solutions

to research questions (Bryman & Bell, 2015). Thus, the survey research design was adopted for this study.

5.2 Population, Sample Size and Sampling Technique

The population of this study consist of all one hundred and seventy-five (175) staff of the Ministry of Finance and Ministry of Budget/Planning in Benin City, Edo State. The population was gotten from the records department of the Ministry as at 2022. The choice of the Ministry is based on ease and accessibility to getting information. In determining the sample size for this study, the Taro Yamane formula for sample size determination was employed on both firms. The Taro Yamane formula is given below:

$$n = \frac{N}{1+N(e)^2}$$

Where n = Sample size

N = Population size

E = Sampling error which is usually $\pm 5\%$

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{175}{1+175(0.05)^2} = 122$$

Thus, the sample size for this study consisted of 122 respondents from the Ministry of Finance and Ministry of Budget/Planning in Benin City, Edo State.

The study adopted the stratified and simple random sampling technique. The stratified sampling technique ensured all employee from all department were captured in the study; thus, they were divided into strata. While the simple random sampling ensured that all employees had a fair and equal chance of been selected into the sample.

5.3 Research Instrument, Validity and Reliability of Research Instrument

Bryman (2012) asserted that data collection and analysis are reliant on the methodological approach used. Since the survey research involves the collection of primary data, the questionnaire response format was the data collection instrument. Primary data are the first-hand experience collected data that are reliable, authentic, and objective (Kabir, 2018). The structured questionnaire was the intended means of collecting data from respondents. Using a five point Likert scale, (1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5= strongly agree).

The basic requirement for a good measurement is content validity, which means that the measurement items in an instrument cover the major content of a construct (Churchill, 1979). Thus, a pilot study was conducted and reviewed by three academics to comment on the appropriateness of the research constructs. Based on their feedback, redundant and

ambiguous items was either modified or eliminated. While Cronbach’s alpha which measures the internal consistency among indicators, had a high value of 0.86.

5.4 Model Specification

Three models were developed: first, the model that explains the functional relationship between human resource policies and industrial harmony; second, the model that explains the functional relationship between human resource policies and decision making; and lastly, the model that explains the relationship between industrial harmony and decision making. With the aid of SMART PLS software, the three models were regressed. The models for the study were therefore stated functionally as:

Model 1:

Human Resource Policies (HRP) and Industrial Harmony (IH)
 $IH = f(PTP, LTP, ECP, EEP)$ (3.1)

Econometrically, the model can be specified as:
 $Ihi = \alpha_0 + \alpha_1 PTP_i + \alpha_2 LTP_i + \alpha_3 ECP_i + \alpha_4 EEP_i + \xi_i$ (3.2)

Where:

- IH = Industrial Harmony
- PTP = Promotion and Transfer Policies
- LTP = Leave and Time-off Policies
- ECP = Employee Conduct Policies
- EEP = Employee Exit Policies
- ξ = Error term
- A priori sign/ expectation: $\alpha_0 > 0, \alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0$ (3.3)
- α_0 = Parametric constant
- $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ = Parametric coefficient

Model 2:

Human Resource Policies (HRP) and Decision Making (DM)
 $DM = f(PTP, LTP, ECP, EEP)$ (3.4)

Econometrically, the model can be specified as:
 $Dmi = \alpha_0 + \alpha_1 PTP_i + \alpha_2 LTP_i + \alpha_3 ECP_i + \alpha_4 EEP_i + \xi_i$(3.5)

Where:

- DM = Decision Making
- PTP = Promotion and Transfer Policies
- LTP = Leave and Time-off Policies
- ECP = Employee Conduct Policies
- ξ = Error term
- A priori sign/ expectation: $\alpha_0 > 0, \alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0$ (3.6)
- α_0 = Parametric constant
- $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ = Parametric coefficient

Model 3:

Industrial Harmony (IH) and Decision Making (DM)
 $IH = f(DM)$ (3.7)

Econometrically, the model can be specified as:
 $Ihi = \alpha_0 + \alpha_1 Dmi + \xi_i$ (3.8)

Where:

- IH = Industrial Harmony
- DM = Decision Making
- ξ = Error term
- A priori sign/ expectation: $\alpha_0 > 0, \alpha_1 > 0$ (3.9)
- α_0 = Parametric constant
- α_1 = Parametric coefficient

5.5 Data Analysis and Presentation

This section contains subsections discussing the statistical analysis employed in determining the convergent and discriminant validity, assessing validity, validation of second order construct and confirmatory factor analysis.

Exploratory Factor Analysis

The Table below illustrates a very clean factor structure in which convergent and discriminant validity is evident by the high loadings within factors, and there were cross-loadings between factors which have been expunged.

Table 1 shows the factor loadings for each of the factor.

Table 1: Pattern Matrix

Item	F1-PTP	F2-LTP	F3-ECP	F4-EEP
HR Policies				
PTP1	0.785			
PTP2	0.762			
PTP3	0.651			
PTP4	0.728			
PTP5	0.818			
PTP6	0.677			
PTP7	0.747			

LTP1	0.680		
LTP2	0.728		
LTP3	0.779		
LTP4	0.730		
LTP5	0.813		
ECP1		0.833	
ECP2		0.804	
ECP3		0.747	
ECP4		0.702	
ECP5		0.779	
EEP1			0.625
EEP2			0.782
EEP3			0.758
Item			
<i>(b) Decision-Making</i>		F1-DM	
DM1	0.829		
DM2	0.663		
DM3	0.799		
DM4	0.790		
DM5	0.697		
DM6	0.800		
Item			
<i>(c) Industrial Harmony</i>		F1-IM	
IM1	0.795		
IM2	0.734		
IM3	0.760		
IM4	0.742		
IM5	0.770		

Source: Researchers' computation (2024)

Assessing Validity

The reliabilities of human resource policies, decision making and industrial harmony were assessed with Cronbach's Alpha. The table below report means, standard deviations, correlations, and reliability values for each of construct. The reliability values for all constructs are all greater than .70, and this is considered acceptable (Nunnally, 1978).

Table 2: Means, standard deviations, correlations and reliability of (a) HR Policies (b) decision making and (c) industrial harmony

Variables	Mean	SD	1	2	3	4	5	Reliability
<i>(a) HR Policies</i>								
1. Promotion & Transfer Policies	4.29	0.454	-					0.780
2. Leave and Time-off Policies	4.02	0.445	0.219*	-				0.737
3. Employee Conduct Policies	4.26	0.511	0.092	0.211*	-			0.750
4. Employee Exit Policies	4.35	0.002	0.123	.235**	.282**	-		0.799
<i>(b) Decision-Making</i>								
1. DM	4.37	0.645	-					0.722
<i>(c) Industrial Harmony</i>								
1. IM	4.20	0.559	-					0.704

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Test of Hypotheses

The results of the proposed structural equation model analysis are presented in Table 3 indicating support for the hypotheses.

Table 3: Result for proposed structural equation model

Hypothesis	Relationship	t-statistics	p-value	Result
H1	PTP-IH	2.113	.035	Supported
	LTP-IH	5.379	***	Supported
	ECP-IH	3.649	***	Supported
	EEP-IH	2.169	.030	Supported
H2	PTP-DM	7.159	***	Supported
	LTP-DM	5.728	***	Supported
	ECP-DM	8.872	***	Supported
	EEP-DM	1.875	.061	Unsupported
H3	DM-IH	2.177	.030	Supported

Source: Researchers' computation (2024)

The statistical significance of Hypothesis 1 confirms that human resource policies have significant impact on industrial harmony. Our report shows that all the variables of HR policies individually affect industrial harmony positively with a t-value above 1.96 as above. Specifically, Table 3 revealed that there is a positive and significant influence of HR policies on industrial harmony. However, we can state that the impact of each of the variables differ. For instance, leave and transfer policies effect on industrial harmony had the largest impact, followed by employee conduct policies, then employee exit policies and promotion and transfer policies.

Hypothesis 2 is supported except for employee exit policies that has no significant relationship with decision-making. The result shown above reads that each of the variables of HR policies has a significant impact on decision-making except for one. From the result, we found that the level of impact on decision-making varied with level of employee conduct policies having the greatest impact followed by promotion and transfer policies and leave and transfer policies. That is to say, their t-values were all above 1.96 and $P < 0.05$. For employee exit policies, the t-value though almost a bit on the borderline or threshold of 1.96, was found not to be significant.

Hypothesis 3 is supported stating that there exists a significant relationship between decision-making and industrial harmony. With a t-value of 2.177, we concluded that the impact of decision-making on

industrial harmony is statistically significant and positive

6. Discussion of findings

The study has shown that HR policies forms a second-order construct composed of the first-order constructs of promotion and transfer policies, leave and time-off policies, employee conduct policies and employee exit policies - the four major components of HR policies consideration. Through the analysis of the relationship of HR policies constructs with decision making and industrial harmony, it was demonstrated that HR policies impact directly on both decision making and industrial harmony. This supports the findings of Barbara, Amah, and Okocha (2021) and Sholokwu and Owori (2016) that confirmed that human relations policies positively impact on industrial peace and harmony in an organization. Barbara, et al (2021) supported the findings of this research by establishing that human relations influence the peace and harmony of an organization, and therefore recommended that management be attentive to organizational conflict, as well as engage interactive sessions, good communication skills, and other strategies to preserve a cordial relationship, co-operation, and high productivity in the organization. Onimole, Akinseye and Adebuseye (2020) found that most organization conflicts and industrial disharmony result from lack of knowledge and proper understanding of the facts due to inadequate or complete absence of communication. Likewise, Onimole, Akinseye and Adebuseye (2020) findings supports this study's outcome that a sound

basis of employer-employee relations which is essential for industrial harmony is the creation of a well-established understanding that the two parties are in the pursuit of a common goal and that in this pursuit, their roles are complementary. MacCrimmon (1974) and Rollinson (2008) supports and highlights those perceptions, personality, attitude towards risks, and ethics and values can strongly influence the way top management view a problem and as such are likely to influence the decision-making process.

Based on the second hypotheses, the result reads that each of the variables of HR policies has a significant impact on decision-making except for one. The study found that employees will remain loyal to the organization if there is a form of participation or involvement in decision making, especially those that affect their work performance. Also, the employees acknowledge the use of suggestion box to channel their complaints. The study found that the level of impact on decision-making varied with level of employee conduct policies having the greatest impact followed by promotion and transfer policies and leave and transfer policies. Obi and Agwu (2017) that the chief executive and top management of an enterprise must seek broad spectrum of input from both inside and outside sources to make good decisions that would move the organization forward, especially with respect to the formulation and implementation of human resource policies.

Hypothesis 3 is supported stating that there exists a significant relationship between decision-making and industrial harmony. Participation of employees in decision-making processes has resulted in successful value creation in many organizations; though the extent to which employees should participate in organizational decision making is still a matter of debate (Irawanto, 2015). Employee involvement is one of the important aspects of organizational life to achieve increased organizational effectiveness and positive employee perceptions (Phipps et al., 2013). A study by Tamunosiki and Sorbarikor (2018) noted that employee involvement in decision making influences workplace harmony in manufacturing companies in Port Harcourt, Nigeria.

7. Conclusion

This study provides empirical justification for a framework that identifies four key dimensions of HR policies and describes the relationship among HR policies, decision making, and industrial harmony. It examines three hypotheses which in the process assessed the validity and reliability of the instrument used. This study provides empirical evidence to

support conceptual and prescriptive statements in the literature regarding the impact of HR policies. We can conclude that all variables have statistical significance excluding employee exist polices, thus, there exists a significant relationship between HR policies, and decision making, and industrial harmony.

On the bases of findings of the study and conclusion, the following recommendations for policy making and further studies are made:

- Management needs to improve on the level of job involvement of employee in the decision-making process especially those human resource policies that affect them as this would eliminate any form of discrimination to a minimum.
- Organizations should frequently interact with employee to set reliability, responsiveness, and other standards. Top management must key into this innovative idea and support it all the way.

The followings are suggested for future study:

- This study can be expanded in terms of its geographical scope to include other public organizations in the state and country.
- A comparative study can also be done between public and private organizations in the state and country.

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Attitude Towards Telemedicine Among Women of Childbearing Age With Fibroid Tumor Attending Aminu Kano Teaching Hospital, Kano State

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Abstract. Telemedicine gains traction, particularly following the COVID-19 pandemic, its potential to enhance healthcare access for women with fibroids remains a critical area for investigation. This study aims to assess the attitudes of women of childbearing age towards telemedicine at Aminu Kano Teaching Hospital, Kano State, Nigeria. A cross-sectional research design was employed to examine the attitudes of 197 women towards telemedicine for managing fibroid tumors. Participants were selected through an availability sampling method, and data were collected via a structured questionnaire. The instrument was validated and assessed using Cronbach's Alpha, revealing a reliability coefficient of 0.82. Data analysis involved descriptive statistics and one sampled t-test at a significance level of 0.05. The study revealed that the majority of respondents were aged between 36-45 years (43.30%), predominantly married (69.71%), and had varied educational backgrounds. The analysis indicated a mean attitude score of 2.1866, falling below the neutral mean of 2.5, with a t-test indicating no statistically significant attitude towards telemedicine ($p = 0.1001$). This suggests that the participants do not exhibit a significant inclination towards the use of telemedicine for managing fibroid tumors. To foster a more positive attitude towards telemedicine among women with fibroid tumors, it is recommended to develop telemedicine platforms that support local languages, implement comprehensive cultural competency training for healthcare providers, and establish telemedicine support centers within the local health system to provide accessible consultations.

Keywords: Telemedicine, Uterine Fibroids, Women's Health, Attitude, Kano State

1. Introduction

Uterine fibroids are benign tumors that grow in the uterus and affect a large number of women of reproductive age throughout the world. Epidemiological studies show that between 70 and 80% of all women experience fibroids by the age of 50, with a higher prevalence in African American women (Stewart et al., 2017). These tumors may lead to considerable medical burdens, specifically profuse menstruation, pelvic discomfort, reproductive issues, and substantial effects on the quality of life (Marsh et al., 2018). Telemedicine has seen widespread adoption and proved transformative in the healthcare landscape, especially in light of the global COVID-19 pandemic. Telemedicine may help address many of the barriers to health care access, such as geographic location, time, and exposure to infectious environments (Stahl et al., 2020). Now this technology offers opportunities and complications for women with fibroid tumors and how they manage their complicated medical problem. Telemedicine adoption is affected by digital divide factors, which vary across various socioeconomic and demographic groups (Vimalananda et al., 2019). Women have reported high levels of concern about the private and personal nature of gynecological consultations by remote (Sood et al., 2020). Many patients labour under the misconception that complex conditions such as fibroids are not amendable to telemedicine (Arya et al., 2021). This study explored

the attitudes of childbearing aged women at Aminu Kano teaching hospital, Kano, toward telemedicine for the management of fibroid tumors.

1.1 Hypothesis

There is no significant attitude towards telemedicine among women of childbearing age with fibroid tumor attending Aminu Kano Teaching Hospital, Kano State.

2. Methodology

Cross-sectional research is an observational research design that collects data from a population at a specific point in time. This design is primarily used to assess the prevalence of outcomes or characteristics within a defined population, providing a snapshot of the variables of interest (Scribbr, 2023). They allow for the assessment of multiple variables simultaneously, providing a broader understanding of the population (Mwayungu, 2021). The independent variable must precede the dependent variable. This temporal relationship is crucial for implying a cause-and-effect connection; however, causality can only be inferred,

not definitively demonstrated (Neil, 2021). The study population consists of one hundred ninety-seven individuals (197). The study employed an availability sampling approach. The data collection instrument was a structured questionnaire titled 'Knowledge of Telemedicine Among Women of Childbearing Age with Fibroid Tumor'. The instrument consisted of two sections: A and B. Section A comprises of demographic characteristics, while Section B addresses the awareness of telemedicine among women of reproductive age with fibroid tumor. The questionnaire utilised a modified Likert scale with the following values: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. The test-retest reliability method was employed to assess the instrument's reliability. Cronbach's Alpha was employed to calculate the reliability coefficient using the Statistical Package for the Social Sciences (SPSS). The reliability coefficient was 0.82. The data collected for the study were analysed using frequency and percent to describe the demographic characteristics, while one sampled t-test was used to test hypotheses at 0.05 level of significance.

3. Results

Table 1: Demographic Characteristic of the respondents

Variables	Frequency	Percent
Age		
15-24years	47	23.86%
25-34 years	46	23.35%
36-45 years	104	52.79%
Marital Status		
Married	147	74.61%
Widow	22	11.16%
Divorced	19	9.64%
Separated	9	4.56%
Level of Education		
Non-formal Education	22	11.17%
Primary Education Certificate	19	9.64%
SSCE	51	25.89%
NCE/ND	69	35.03%

Degree/HND	36	7.96%
Income Per Month		
N50,000 - N100,000	68	34.51%
N100,001 - N150,000	29	14.72%
N150,001 - N200,000	41	20.81%
N200, 000 and above	59	29.94%
Total	197	100%

Table 1 presents the Demographic Characteristics of respondents. In the age category, the lowest age range comprising of 47 respondents, accounts for 23.86% of the total sample. This relatively small percentage indicates that younger individuals are less represented in this study. With 46 respondents, this age group represents 23.35%. This suggests a moderate presence of young adults, who may be in early career stages or furthering their education. The largest group, with 104 respondents, makes up 52.79% of the total sample. This indicates that the demographic trend in this study is towards the older population which are the middle-aged individuals. Married individuals are 147 (74.61%) of the total sample. Widows are 22 individuals with 11.16%. Divorced women are 19 individuals who fall into this category, while separated are 9. Twenty-two (22) respondents (30.53%) fall under the category of non- formal education, indicating a significant number of women who may have received training outside formal educational systems. With 19 respondents (9.64%), this group shows that some individuals have only completed basic education. A total of 51 respondents (25.88%) have completed secondary education. The NCE/ND category includes 69 respondents (35.02%), indicating vocational or higher education training. The least represented group, with 22 respondents (7.96%), suggests that fewer participants have no formal education. The largest income group, with 68 respondents (33.41%), indicates that many participants earn within this range, which may reflect average earnings in the population studied. This group has 29 respondents (28.20%), suggesting a moderate earning level among some participants. Comprising 41 respondents (24.41%), this income bracket indicates a smaller segment earning higher than average but still within a reasonable range. With 59 respondents (13.98%), this group represents those with higher income levels, possibly indicating greater financial stability or success.

Table 2: Summary of One-Sample t-test on attitude towards telemedicine among women of childbearing age with fibroid tumor attending Aminu Kano Teaching Hospital

	N	Mean	Std. Deviation	df	t-test	Prob	decision
attitude towards telemedicine	197	2.1866	0.53050	196	0.800	0.1001	accepted
Constant Mean		2.5					

Table 2 shows that the mean of attitude score is 2.1866. The assumed constant mean of 2.5. The standard deviation is 0.53050. The t-value of 0.800 indicates the computed value for the test statistic. The p-value of 0.1001 indicates the probability of observing the sample data, or something more extreme, under the null hypothesis (no significant attitude). The significance level of 0.05 was used to determine significance. Since the p-value (0.1001) is greater than the significance level of 0.05, we accept the null hypothesis (H0). This means that there is no statistically significant attitude towards telemedicine among the women of childbearing age with fibroid tumors attending Aminu Kano Teaching Hospital. There is no significant difference between the mean attitude score of women of childbearing age with

fibroid tumors towards telemedicine and the constant mean of 2.5. In other words, the women in this study do not have a significant attitude toward telemedicine.

4. Discussions

Telemedicine technology is the use of telecommunication telecommunications to provide and maintain health care services remotely. This process has been shown to have many advantages including decreased patient travel time, heightened access to patients experiencing mobility challenges, and the capacity to deliver consistent care during emergencies (Koonin et al., 2020); dynamic trends that is related to demographical features, technology affinity and beliefs (Wong et al., 2020). This study

concerns women of childbearing age with fibroid tumors. This demography is especially relevant because fibroid tumors can negatively impact quality of life and make pregnancy much more difficult (Baird & Dunson, 2003). Telemedicine may be an effective management of such conditions; however, the attitude of the population, particularly, towards telemedicine as alternative mode of healthcare delivery is imperative to be understood for its potential diffusivity.

In Nigeria and indeed in many cultures, it is customary to conduct traditional face to face consultations because they involve direct human contact with their associated medley of sensitivities (Ayanlola, 2020). Other women may find it too impersonal to trust getting health care in an unusual way like this, particularly on something sensitive like fibroids. Tech Barriers: Older age or lack of familiarity with technology were major concerns to women and telemedicine. It has been shown that those who do not feel comfortable engaging with technology are less likely to accept telemedicine solutions (Koonin et al., 2020).

Patients may question the quality of care offered via telemedicine. Acceptability can be hampered by questions regarding accurate diagnosis and adequacy of treatment delivered remotely (Wong et al., 2020). Acceptance may be aided by raising awareness of telemedicine benefits. Educational campaigns that highlight the value of remote consultations in the management of chronic conditions will be key (Baker et al., 2021). Ensure that telemedicine platforms are easy to use looking at the technological literacy of this demographic. Making it easier for all women with high tech exposure to exist in these platforms is critical for women's attitudes improvements (Wong et al., 2020). Combining telemedicine with conventional care models might improve acceptance. Initial consultations may be conducted in person, and then later check-ups via telemedicine, so patients can become more familiar with the technology while still keeping a personal connection with healthcare providers (Baird & Dunson, 2003).

5. Recommendations

The following recommendations are made in order to improve on the attitude of women of child bearing age with fibroid tumor towards telemedicine:

1. Develop telemedicine platforms that support predominant local language, alongside English.
2. Implement comprehensive training programs for healthcare providers to understand local cultural nuances and respect religious and social considerations

3. Establish telemedicine support centers within Aminu Kano Teaching Hospital, local community health centers and provide free or subsidized access to telemedicine consultations

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Effect of Brain-Based Learning Strategy on Junior Secondary School Students' Reading Skills in English Language in Maiduguri Metropolis, Nigeria

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Abstract. This study deals with the Effect of Brain-Based Learning Strategy on Junior Secondary School Students' Reading Skills in English language. The study seeks to examine the extent to which the use of a brain-based learning strategy determines the abilities of students in the five sub-skills of reading. These are: pronunciation, vocabulary, grammar, fluency, and reading comprehension. A quasi-experiment design was used. The population of the study comprised all junior secondary school two (JSS II) students of a selected school in Maiduguri Metropolis, Borno State, Nigeria. Two intact classes of the same level from the selected school formed the experimental and control groups respectively. One hundred and twenty (120) students were selected to participate in the study using convenience sampling technique. A self-developed instrument entitled 'English Language Reading Skills Test' (ELRST) was administered as a pretest and posttest to the participants to determine their homogeneity as well as the effect of the strategy. The reliability of the instrument was obtained through Cronbach Alpha's reliability test at the 0.05 level of significance. The data were analysed using independent sample t-test and eta squared was used to examine the effect size. The findings of the study revealed that the brain-based learning strategy has a significant effect on students' reading skills. It is, therefore, recommended that teachers be trained to effectively deploy brain-based learning strategies in their instruction.

Keywords: Brain-Based Learning Strategy, Reading Skills, Pronunciation, Vocabulary, Grammar, Fluency and Reading Comprehension.

1. Introduction

English language teachers, all over the world, have recently become increasingly aware and interested in understanding the psycholinguistic in their quest for appropriate pedagogy. This is because of the growing needs to address complexity and diversity in classroom; particularly with the current trends of advocacy for inclusive education for all categories of students with diverse backgrounds, needs and cognitive ability in a classroom. Therefore, the deployment of brain-boosting activities to support cognitive development of learners become prominent in the teaching and learning.

Brain-based learning strategy is an educational approach that incorporates diverse teaching methods, lesson designs, and education programs that are grounded in scientific research on how the brain learns. This concept is typically built on the ideas of brain-based learning which focusses on crucial variables such as cognitive growth in students (Uzezi & Jonah, 2017). The mind thrives in a collaborative environment (Gardner 1983). Brain-based learning can influence the instructional methods that are closely connected to the learner and learning environment, as certain parts of the brain are directly involved in emotions, consciousness, and memory (Pool, 1997). Both teachers and students possessed a clear understanding of their respective expectations. Brain-based learning was shown to be an efficient learning method that allowed for flexibility in time. It involved a consistent approach to teaching, utilising tactics and continuing questioning and analysis by teachers for their students (Klimek, 2009).

Brain-based learning is a revolutionary learning model that has significant implications for educators and learners (Uzezi & Jonah, 2017). It can be characterized as a method that emphasizes deliberate practice, enhancing students' capacity to retain new information and enabling them to establish realistic objectives and expectations based on observable progress. It is, therefore, neuroscience and psycholinguistic-shaped teaching methods and strategies that tends to enhance teaching and learning.

According to Li (2022), brain-based learning examines student learning and their achievement from the lens of the human brain. It involves unique teaching and learning techniques that are designed based on how attention, retention, motivation, and the cognitive aspects function in human brain. Hence, incorporating the knowledge into teaching and learning to maximise education outcome. By selecting a curriculum and delivery method for each student group according to the science of learning, brain-based learning strategy aims enhance the learning process and its phase. Sousa and Luna (2004) opined that Brain-based learning approach helps facilitating meaningful language learning through the natural way, brain work to help learners to use language in a meaningful context. Using such a brain compatible approach undoubtedly follows the spontaneous techniques learner use their brains. Spontaneous learning experiences maximize the learning opportunities and make learning last longer. According to Wolfe (2001), Brain-based learning is relevant and meaningful to previous mental, emotional and physical experiences strengthen memory. Caine and Caine (2006) view that each brain system within whole brain seem to work collaboratively to provide meaning full learning. Learning is complex process, despite the advent of several teaching and learning theories approaches and strategies. The ultimate goal teacher aspires to achieve is to get their students involved and hopefully engaged in the lesson through carefully selected teaching practice. Moreover, the significance of this strategy on English language skills have been widely accepted.

Fundamental language skills include four key areas: listening, speaking, reading, and writing. Listening skills are about understanding, evaluating, and interpreting the information shared by the speaker. In line with this viewpoint (Jannah, 2015) opined that listening is a creative skill that involves hearing sounds, organizing, comprehending, and exploring the structural and phonological elements of the utterance to arrive at the implicature of the speech or perceived meaning driven by the utterance. On the other hand, speaking skills are crucial for keeping the listener

engaged and ensuring the entire communication process is grasped. According to Nopiyanti (2012), speaking is an interactive process of meaning construction that comprises information production, reception, and processing. It involves both speaker and listener and is one of the most difficult skills for language learners to master. To communicate effectively, it's important to have clear and fluent expression and language use. Reading is also another vital skill that helps in understanding different types of texts, including their background and implied meanings. Writing skills involve the capacity to clearly share ideas through well-organized writing and smooth information flow. In communication, individuals usually use a mix of these skills at the same time. Among these four language skills, reading is the most critical skill for language learners to master at all because students do more reading not only in language related subjects but also other discipline right from the basic education levels.

Reading skills can be defined as a skill that help to understand different texts, their context and inference. These skills are crucial to improving your overall literacy skills as they can help enhance your vocabulary, expression, analysis and communication. The following are types of reading skills. Skimming: it is a technique that allows you to quickly read through a text and pick out the main ideas. Scanning: it's a technique that allows you to quickly read through a text and find specific information, intensive reading is a technique that allows you to read a text slowly. And carefully in order to understand all the details and nuances. Extensive reading/speeding reading is a technique that allows you to read a text quickly. Reading skills has a great importance like it stimulates imagination; it enhanced vocabulary it also helps in cognitive development and greater concentration. Reading sub-skill refers to the well-planned reading approach which helps the learners to comprehend and perceive the meaning of the text effectively. There are different kinds of reading sub-skill such as skimming, scanning, intensive reading, extensive reading etc.

Pronunciation is a key component of reading that refers to the ability to correctly articulate and enunciate the sound of a language, word and phrases. It involves understanding the phonetic element of a language such a vowels and consonants and being able to produce these sounds perfectly (Swingley, 2020). Good pronunciation skills are essential for effective communication as they ensure that others can understand what you are saying clearly and accurately. The second component is grammar which stands for the rules of a language governing the organization of the language structure as well as their meaning. It

includes several aspects of English language like words, phrases, clauses, sentences and other larger units. According to Pennington (2010) a basic understanding of grammar is fundamental for higher levels of communication, achievement in standardized tests. Reading comprehension and fluency are another vital part of daily life and skills that are tied to the lifelong success in academic and occupational perspectives. Shanahan (2000) emphasized the importance of developing reading fluency in the primary grades as essential for the transfer of literacy skills to other academic areas. Scholars like Pinnell and Fountas (2009) viewed reading comprehension as reflective reading that struggling students have trouble recognizing the words of age-appropriate text. It is the understanding of the text language and textual meaning.

Developing reading skills requires both student and teachers to work hard to overcome the perceived challenges that students mostly encounter especially as the basic level. These are: confusion about the meaning of words and sentences; inability to connect ideas in a passage; The omission or glossing over of detail can make it difficult to identify crucial information from minor details; lack of concentration during reading. In the context of this study, it is observed that students at all levels struggle to improve their reading skills. Though some studies attributed the poor reading ability to the proliferation of social media that tends to distract students from good reading habit. Some studies highlighted key context-specific factors such as teacher quality and their motivation, socio-economic status and many more. Several efforts made to address this through national reading framework, seminars and academic gathering. Yet, there are significant issues of poor reading skills amongst public primary and secondary school leavers. Therefore, this research seeks to examine Effect of Brain-Based Learning Strategy on Students' Reading Skills.

1.1 Statement of the Problem

Students right from lower basic level are expected to have an improved reading proficiency. This is because reading is a crucial skill that guarantees academic success of all other subjects. Despite its importance, students struggle poorly to read especially at the primary, junior and secondary school levels in Nigeria. They feel unsafe, stressed or experiencing a low cycle of brain activity, learning becomes impossible and they may hate the learning process as a whole and may drop out. Several factors are believed to be contributing to this issue; including teachers' inability to deploy suitable pedagogies, lack of resources, lack of capacity to adjust to the diverse needs of the

students etc. Several attempts are recurrently made to address the problem by organizing teachers training, workshops, seminars, conference etc. yet the issue is persistent. Therefore, this research tends to examine Effect of Brain-Based Learning Strategy on Student Reading Skills.

1.2 Objectives of the Study

The Objectives of the study are to examine:

- Effect of Brain-Based Learning Strategy on Students' Pronunciation
- Effect of Brain-Based Learning Strategy on Students' Grammar
- Effect of Brain-Based Learning Strategy on Students' Vocabulary
- Effect of Brain-Based Learning Strategy on Students' Reading Comprehension
- Effect of Brain-Based Learning Strategy on Students' Fluency

1.3 Hypothesis

The following hypothesis was tested:

There is no significant effect of Brain-Based learning strategy on junior secondary school students' reading skills in English language.

2. Methodology

The research design used for this study was quasi experiment to determine the baseline and endline performance of the two groups. The population for this study comprised of all Junior secondary school two (JSS II) students of a selected school. Total number of 120 students were sampled using convenience sampling technique. The participants were grouped into experimental (60) and Control (60) groups. English language reading skill test was developed. The questions were designed based on the objectives type question; fill in the blank and essay questions. The instrument was subjected to validity and reliability test. Content and face validity was obtained by subjecting the tool to series of reviews by the subject expert and English language teachers. Reliability of the instrument was obtained using Cronbach Alpha's reliability test at 0.05. The data was collected through pre-test and post-test. The pre-test was administered to both groups to establish their homogeneity in the reading skills whereas the post-test was administered after the treatment to examine the effect of reading skills on the treatment groups. Independent T-test was used to determine the effect of brain-based learning

strategy and the effect size was measured using eta square.

3. Results and Discussion

The hypothesis which stated *‘There is no significant effect of Brain-Based Learning Strategies on junior*

secondary school students’ reading skills in English language’ was tested by comparing the performance of the experimental and control groups in both pre-test and post-test. An independent t-test was used to determine whether there was statistically significant difference between the performance of the two groups. The results were presented as in the following:

Table 1: Comparing the Performance of the Experimental and Control Groups in reading skills

		t-test for Equality of Means		
		Df	Sig (2-tailed)	Mean Difference
Pronunciation	Equal variances assume	68	.000	11.000
	Equal variances not assumed	48.023	.000	11.000
Grammar	Equal variances assumed	68	.000	12.571
	Equal variances not assumed	45.282	.000	12.571
Vocabulary	Equal variances assumed	68	.000	11.857
	Equal variances not assumed	48.643	.000	11.857
Read Comprehension	Equal variances assumed	68	.000	10.143
	Equal variances not assumed	47.173	.000	10.143

Table (1) presents the independent sample t-test of the control and experimental groups to compare their performance in the post-test. The results showed that experimental group outperformed their counterpart in all the sub-skills of reading at 0.01 level of significance. Thus, affirming the effect of the brain-based learning strategy on students reading skills.

To determine the effect size of brain-based learning strategy on the experimental group’s reading skills, eta square was used. The results showed high effect size of the brain-based learning strategy on all the five subskills of the reading.

4. Summary of the Findings

The following are the key findings of the research:

- Students’ pronunciation significantly improved when brain-based learning strategy deployed.
- Students learn grammar better when brain-boosting activities are incorporated into the teaching and learning.
- Students’ vocabulary increased due to the implementation of the brain-based learning strategy
- Students showed improved reading comprehension when teachers incorporate brain-boosting activities into the teaching.
- Students reading fluency enhanced due to the effective implementation of the brain-based learning strategy

5. Conclusion

Based on the findings of the study, it was concluded that the brain-based learning had a significant effect on students’ pronunciation, grammar, vocabulary, comprehension and fluency. When teachers incorporate brain-based activities into their teaching, students feel relaxed, secured and physiologically ready to learn faster.

6. Recommendations

Based on the findings of the study, the following recommendations were made:

- School administration should provide adequate instructional facilities needed for the implementation of the brain-based learning strategy to maximise its benefit.
- School administration should encourage teachers to learn variety of methods and strategies to enhance their pedagogical capacity for improved teaching and learning in schools.
- Government should invest heavily in proving safe, secure and conducive learning environment for the overall teachers’ job performance as well as students’ quality learning.
- Professional learning community should be promoted to create platform for teachers to

share experiences and exchange knowledge to address pedagogical gaps in schools.

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The Impact of Foreign Exchange Rate Volatility on Economic Growth of Nigeria

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Abstract. The study examined the impact of foreign exchange volatility on economic growth using trade balance and foreign direct investment. Data for this series were assessed from Central Bank of Nigeria Statistics Bulletin covering from 1990-2023. Autoregressive Distributed Lag Model and estimation technique was employed using STATA. The result showed that there is a positive relationship between exchange rate and GDP growth rate. However, Exchange rate volatility, FDI as a percentage of GDP and foreign reserve exhibits a negative but insignificant relationship with the growth rate of GDP. 1 percent increase in Exchange rate volatility, FDI as a percentage of GDP and foreign reserve leads to 19%, 426% and 469% fall in the growth rate of GDP. The R-squared value of 0.680206 indicates that approximately 68% of the variation in the dependent variable, growth rate (GDP), is explained by the variation of the independent variables included in the model. Specifically, Foreign exchange volatility (EVAT) was found to have insignificant impact on economic growth in Nigeria both in the long run and the short run while inflation was found to have significant impact on economic growth both in the long-run and in the short run. In affirmative, the result suggests that FDI, OPN, RES and FTB were all found to have significant impact on economic growth in the short run. The study suggests that it is imperative for policymakers in Nigeria to prioritize measures aimed at addressing the foreign exchange volatility, ensuring the stability of inflation and ensuring the existence of balanced trade if not a surplus balance.

Keywords: Impact, Foreign Exchange rate, Volatility, Economic Growth, and Nigeria

1. Introduction

The Nigerian economy has been bedeviled by the challenge of instability in its foreign exchange rate

market due to a high level of volatility (Kelikume & Nwani, 2019). Exchange rate fluctuation is the continuous gyration in the foreign exchange market of nations which has emerged as the dominant subject of discussion in recent international finance literature owing to its fatal consequences on the economies of developing nations like Nigeria (Alagidede and Ibrahim, 2023). In Nigeria, the formulation and implementation of the infamous Structural Adjustment Programmed (SAP), a component of the Economic Recovery Program (ERP) in 1986, introduced financial sector reforms. Part of the reforms includes the jettisoning of the fixed exchange rates in favor of the free-floating regime in the late 1980s. This transition was conducted based on the assumption that flexible exchange rates would curb the boom-and-bust syndrome and turn the country towards a growth trajectory.

The adverse impact of the global economic and financial crisis on the Nigerian exchange rate was a phenomenon as the Naira exchange rate to the dollar rose dramatically from about ₦120/\$ to more than ₦180/\$ between 2008 and 2009. In 2023, Nigeria witnessed an unprecedented surge in the inflation rate, reaching an 18-year high of 28.9 percent as of December 2023, with an average of 24.5 percent for the year. The enduring inflationary pressures stemmed from global supply chain disruptions resulting from the prolonged Russia-Ukraine conflict, heightened energy prices, and food scarcity. Domestically, challenges such as disrupted planting activities, fuel subsidy removal, exchange rate depreciation, and escalating logistic costs had substantially increased business operating expenses and impeded overall productivity. The non-oil sector retained its role as the primary driver of the economy, exhibiting a growth rate of 3.0 percent and contributing 94.3 percent to the total real GDP in the first three quarters of 2023 (Naseem, 2012). Conversely, the Oil sector remained

in recession, contracting by 6.2 percent due to persistent oil theft, ageing infrastructure, and insufficient investments (Tayo & Aduloju, 2023).

Some factors which cause volatility in the exchange rate are government policy, interaction of demand and supply, activities of the Nigerian Stock Exchange (NSE), international trade oil glut and recession. However, there were inadequacies in the exchange control system as a major control mechanism. This led to the introduction of the Second-Tier foreign exchange market (SFEM) in 1986. The SFEM was a market established by law for the buying and selling of foreign exchange at market determined rates. The aims of the SFEM were to develop a realistic market-oriented exchange rate for the naira, so as to reduce the demand for foreign exchange to the available supply, reduce the pressures on the balance of payments in order to stop further accumulation of trade debts, reduce imports, stimulate export and pave the way to a self-reliant and sustainable growth. Unfortunately, the Nigeria foreign exchange market has not performed maximally, even with the introduction of various institutional reforms like Bureau De Change (1989), the Autonomous Foreign Exchange Market (AFEM) (1995), and the Inter-Bank Foreign Exchange Market (IFEM) (1999). The dividing foreign exchange earnings, according to Obadan (2016) has been as a result of some factors like weak capital market, poor management of diversified risk and weakness on the part of Bureau De Change in earning a stable and efficient exchange volatility rate in the Nigerian economy.

However, fluctuations in exchange rate in Nigeria have been more in the post Structural Adjustment Program (SAP) because of external shock from sharp decline in the international crude oil prices which affects Nigeria's external reserve. This consequence of foreign exchange rate volatility has led the researcher to ask the following questions:

To what extent does foreign exchange rate volatility affect economic growth in Nigeria?

Based on this question, the present study examined foreign exchange volatility and its consequence on economic growth in Nigeria.

1.1 Statement of the Problem

Nigeria's foreign exchange rate has been a theme of discuss between policy makers, concerned monetary authorities and academics because of the recognition of the vital role exchange rate plays in the achievement of sustainable growth. Optimal foreign exchange rate policy is designed to obtain real exchange rate (RER)

that maintains both internal and external balance (Agu, 2015). However, maintaining a realistic exchange rate for the Naira in Nigeria is very crucial, given the peculiar structure of the Nigerian economy. For example, the Naira, be denoted here in after as the Naira sign (N) unless stated otherwise, has continued to depreciate from N0.61 in 1981 to N2.02 in 1986. In addition, towards the end of the year 2022, the naira depreciated to N750 and in February, 2022 the exchange rate of one US dollar (USD) to Naira was over N800 for the official rate while the parallel market rate was about N1,200 and above due to lack of aggregate monetary policy of naira control over exchange rate volatility in Nigeria.

However, since the introduction of Structural Adjustment Programme (SAP) in 1986 till date, Nigeria has adopted various types of foreign exchange rate policies. Worthy of note is that despite the adoption of various types of foreign exchange rate mechanisms over the years, the policy over currency floating might affect exchange rate volatility since it has exhibited the features of continuous depreciation and instability as well as failed to maintain both internal and external balances causing declines in the standard of living in the economy, increased cost of production which also leads to cost push inflation. In addition, this has tended to undermine the international competitiveness of non-oil exports and made planning and projections difficult at both micro and macro levels of the economy. A good number of small and medium scale enterprises have been strangled out as a result of low dollar/ naira exchange rate.

1.2 Objective of the Study

The main objective of this study is to investigate foreign exchange rate volatility and its consequence on economic growth in Nigeria. The specific objectives of the study are to:

- Determine impact of foreign exchange rate volatility on economic growth of Nigeria.

1.3 Research Question

To what extent is the dose foreign exchange rate volatility impact on economic growth of Nigeria?

1.4 Hypothesis

Ho₁: There is no significant impact of foreign exchange volatility and economic growth of Nigeria.

2. Review of Related Literature

2.1 Exchange Rate

According to International Monetary Fund (IMF), cited in Mati, (2014), "Foreign Exchange is " a monetary authorities' holdings of claims on foreigners in the form of bank deposits, treasury bills, short-term and long-term government securities and other claims usable in the events of balance of payment deficits, including non-marketable claims arising from inter-central banks and inter-government arrangements, without regard to whether the claim is denominated in the currency of the debtor or creditor". However, foreign exchange rate market "can be defined as foreign currency or any other financial instruments acceptable as a means of payment or exchange for international transactions (Oduola, 2021). The emphasis here is the rate of exchange of the currencies.

Fixed or Pegged Exchange Rates: The fixed exchange rate is a phenomenon which occurs when the rate of a currency against other currencies is fixed. Under the pegged exchanged rates, all exchange transactions take place at an exchange rate that is determined by the monetary authorities (Adetifa, 2015). This connotes that the exchange rate of a currency to other currencies is stable. This allows for an increase in reserve of the country if there is a favourable balance of trade. International trade is encouraged because prices of goods are more predictable and long-term capital flows in an orderly manner can be encouraged.

Fluctuating Exchange Rates: This occurs when the currency of a country against other currencies is not stable. The rates are determined by market forces. This implies that the market is unpredictable, thus, leading to economic instability, high risk, possibility of incurring loss on investment in foreign exchange. Under this volatility of freely fluctuating exchange rates, if there is an excess supply of a currency, the value of that currency in foreign exchange market will fall. This will lead to depreciation of the exchange rate. For example, like we have in Nigeria at present, where the exchange rate of Nigeria naira to America dollar was N158 to \$1 as at December 2022 but has moved to N168 to \$1 by December 2023 in the open market. This is as a result of high demand for dollar and excess supply of naira. On the other hand, shortage of a currency will lead to the appreciation of exchange rate thereby leading to restoration of equilibrium in the exchange market. These market forces operate automatically without any actions on the part of monetary authorities (Adetifa, 2023). The excessiveness of naira floating caused subsequent implication to foreign exchange volatility which

affects economic growth of the Nigeria today, there is high inflation, interest rate, low foreign direct investment, poor development of small scale and medium business across the country. The absence of the economic factors leads to low inadequate economic growth in Nigeria (Adu, 2024).

Foreign exchange rate volatility is seen as a general phenomenon around the globe which might have adverse effect on trade. Economists are still very much interested in the operations involved in exchange rate especially in developing countries. Exchange rate uncertainty is said to probably have a negative effect on international trade as bilateral trades are threatened with the risks involved. The economic relationship supporting the negative link is the unwillingness of firms to take on risky activity, namely trade (Anderton & Skudely (2021). Exchange rate volatility is a risk associated with unexpected changes in exchange rate. This is caused by some economic factors such as inflation rate, interest rate and balance of payments (Ozturk 2016).

2.2 Concept of Economic Growth

Economic growth involves changes in material production during a relative short period of time, usually one year. In economic theory, under the concept of economic growth implies an annual increase of material production expressed in value, the rate of growth of GDP or national income. Growth can be achieved, for it does not achieve the developmental course of the economy. Therefore, economic growth amounts involve not only an expansion in production resources, but also all the other socioeconomic processes and changes caused by the influence of economic and beyond economic factors (Senadza, 2021). So, we can view economic growth as amounts that involves not only an increase in material production, but also all the other socioeconomic processes and changes caused by the influence of economic and beyond economic factors (Diaba, 2017).

Economic growth refers to an increase in the size of a country's economy over a period of time. The size of an economy is typically measured by the total production of goods and services in the economy, which is called gross domestic product (GDP). Economic growth can be measured in 'nominal' or 'real' terms. Nominal economic growth refers to the increase in the dollar value of production over time. This includes changes in both the volume of production and the prices of goods and services produced. Economists normally talk about real economic growth that is, increases in the volume produced only, which takes away the effect of prices

changing. This is because it better reflects how much a country is producing at a given time, compared with other points in time. Modern economic growth is an incomplete process in its continuation which often changes the dominant trends. Economic growth is characterized by direction, social necessity, and also by government regulation. Scientific sources offer different definitions of “economic growth” category, and a lot of them claim to be a complete reflection of its essence. It is necessary to show two main points: firstly, such conceptions as “economic growth” and “economic development” should be distinguished, and secondly, in a variety of definitions of growth, as a rule, one or another essential characteristic of that category is reflected. An important feature of the development is in improving the welfare of all groups of the population, so that its financial security increases. But economic growth does not mean the equal financial security improvement of all groups of population (Waledele, 2018).

2.3 Impact of foreign exchange rate volatility

The nexus of economic growth and real exchange rate volatility has been well trashed out by existing economic and financial literatures through selected macro-economic variables and identities, such as trade, investment stocks, unemployment, and productivity. In the area of exchange rate volatility and economic growth, Javed and Faoq (2019) using the auto regressive distributed lag model in the study of this relationship in Pakistan discovered that domestic economic performance is very sensitive to exchange rate volatility in the long run. The link between foreign exchange volatility and economic growth is still up for debate. There are three types of studies in this area: those that believe a fixed exchange rate regime can contribute to faster economic growth; those that believe a floating exchange rate regime can contribute to faster economic growth; and those that believe a floating exchange rate regime can contribute to slow economic growth. Moreno (2020), on the other hand, discovered that the foreign exchange system has a beneficial impact on economic growth, with nations with pegged exchange rates growing faster than those with fixed rates. A major goal of macroeconomic policy is rapid economic growth in a country. Economic growth is measured in terms of persistent growth in national income which translates to increase in the amount of goods and services produced in an economy. Production of goods and services involve exports and imports which in turn involves transactions in foreign exchange. Foreign exchange volatility in post Bretton Wood System has been characterized by instability and this has raised concern about its effect on economic growth. The impact of

exchange rate volatility on growth, seen as a comprehensive measure of the benefits and costs of exchange rate stabilization can be x-rayed through international trade (imports/exports), foreign direct investment, credit flow, and asymmetric shock, some of the most important transmission channels from exchange rate volatility on growth (Arratibel, Furceri, Martin and Zdzienicka, 2019). Previous research on the impact of exchange rate stability on growth has tended to find weak evidence in favour of a positive impact of exchange rate stability on growth. For large country samples in the words of Ghosh, Gulde and Wolf (2013), there is weak evidence that exchange rate stability affects growth in a positive or negative way.

The appreciation of currency happens by an upward movement while a downward movement indicates a loss in value (depreciation) against exchange rate (Anyanwu, Ananwude, & Okoye, 2017). The issue of exchange rate volatility and management in both developing and developed economies has attracted the attention of researchers and policymakers especially due to its impact on macroeconomic indicators: on investment. The centrality of exchange rate as one of the major macroeconomic policies derives from the fact that for most countries, the prevailing objective of monetary policy is price stability. Consequently, volatility in the exchange rate is generally counter-productive to the goals of price stability. This explains the political sensitivity of exchange rate regimes in both developing and developed economies. There is a widespread presumption that volatility of the exchange rates of developing countries is one of the main sources of economic instability in the world. The impact of the global economy on emerging countries like Nigeria is driven significantly by swings among the currencies of the major economic powers like United State. In recent years, these swings have been enormous, volatile and frequently unrelated to underlying economic fundamentals (Adeoye & Saibu, 2023). The swings and instability in exchange rates have prompted monetary authorities in developing countries to intervene on ad hoc and episodic basis, without any clear sense of a sustainable equilibrium. Such exchange rate stability intervention typically comes too late to prevent severe currency misalignment and volatility. These imbalances, in turn, trigger major economic distortions, protectionist trade pressures, and inevitably sharp currency reversals (Adeoye & Saibu, 2022).

An efficient and effective economic management is the ability to design and implement appropriate policies that enhance and facilitate high performance in an economy’s gross domestic product (GDP) vis-à-vis the balance of payment. In other words, a policy

that drives the economy in a positive direction towards the attainment of the ultimate goals of increased prosperity, sustainability, and general improvement on the standard of living. The instrument of macroeconomic management is either macroeconomic (fiscal, monetary, exchange rate, and external debt policy instrument) or microeconomic (sectoral policy instruments) comprising agricultural, industrial, and social sector development policies (Ojo, 2021). There is ample evidence, however, that the government did not use exchange rate policy effectively and actively to adjust and correct balance-of-payments disequilibrium. This confirms the statement of (Oshikoya, 2014) that “the limited adjustments in the official nominal exchange rate coupled with Nigeria's high inflation rate led to real exchange rates that appreciated by more than 64 percent between 1973 and 1984. The high real appreciation of the Nigerian currency caused imports to be 44 percent cheaper than nontraded goods in 1981 relative to 1972 and also intensified the Dutch disease phenomenon”. For the purposes of adjusting the balance of payments, one of the most significant macroeconomic policy instruments is the foreign exchange rate. It is therefore necessary to investigate the implications and nature of the foreign currency policies formulated, adopted and implemented by the government of Nigeria over the time period under discussion (1981 - 2020), as well as the impact of the fluctuations on the Nigerian economy, in order to better understand the situation combustion engine valve actuator. Furthermore, in conjunction with variable timing, the piezoelectric control-based pilot allows for direct regulation of other engine valve parameters including variable lift and seating velocity (Dornbusch 2020).

2.4 Consequences of foreign exchange volatility on economic growth in Nigeria

The Nigerian economy has been visibly distressed in the different phases of exchange rate management (ERM); each coming with its own, possible problem. According to Idika (2018), frequent changes in foreign exchange policies caused by unstable political environment have prevented these policies from coming full circle. Exchange rate stability, which is essential for growth is influenced greatly by the appropriate policy mix by government in their quest to attain macroeconomic targets. Fluctuations in exchange rate have powerful consequence on imports and exports of the countries in question through relative prices of goods. Mordi (2016) posited that the Nigerian economy is highly dependent on imports for both consumption and production. According to World Bank (2015), many oil producing nations are exposed to variations in exchange rate due their large

oil wealth. This variation which acts as tax on investment in trade goods production has adverse impact on growth especially on agricultural and manufacturing sectors. Ewa (2011) agreed that the exchange rate of the naira was relatively stable between 1970 and 1979 during the oil boom era and when agricultural produce accounted for more than 70% of the nation's Gross Domestic Products (GDP). In 1986 when Federal government adopted Structural Adjustment Programme (SAP), the country moved from a pegged to a flexible regime where foreign exchange rate was left completely to be determined by market forces but with monetary authorities intervening periodically in the foreign exchange market in order to attain some strategic objectives (Mordi, 2016). This inconsistency and lack of continuity in exchange rate policies aggravated the unstable nature of the naira rate which reduce the level of economic growth in Nigeria (Gbosi, 2023). Benson and Victor (2020) and Aliyu (2021) noted that despite various efforts by the government to maintain a stable exchange rate, the naira has depreciated throughout the 80's to date. Gross National Product (GNP) was similarly affected. The combined effects of exchange rate variability on GDP and GNP, among others, resulted in the abysmal low level of per capita income of Nigerians.

The economic implication of this may not be clear to the ordinary citizens. What they invariably understand is that the Naira has lost reasonable proportion of its purchasing power. This is often reflected in the quantity of goods and services purchased by Naira. Another area where deplorable state of the GDP and GNP in Nigeria usually become evident is in unemployment rate. Consequent upon the intrinsic relationship between these variables, unemployment rate in the country has continued to rise unabated with decline in the GDP and GNP. There is no gainsaying that the economic, psychological and physical consequences of unemployment in a country like Nigeria where provision of social welfare for the unemployed is seen as hallucination, can better be imagined than described. Following the seminal work of Mundell (1961) and McKinnon (1963) on optimum currency area (OCA) theory, examining foreign exchange rates volatility and its consequence to economic growth and overall performance in the short, medium and long-term has been a topical subject of debate in the international trade and finance literature. However, there is an absence of consensus among scholars in this research space. Even though some studies (Greenaway-McGrevy, 2018; Ismailov & Rossi, 2018) find evidence that exchange rates comove with macroeconomic foundation over long horizons, contemporary literature in international

finance is: exchange rates are unpredictable, especially at short horizons (Della et al., 2019).

The consequence of excess exchange rate volatility has been identified to reduce economic growth by creating business uncertainty, deteriorating competitiveness, lowering productivity and profits, and increasing domestic prices. Ahiabor and Amoah (2019) examined the link between exchange rate volatility and long-run productivity growth. It revealed a non-linearity between real exchange rate volatility and output volatility among emerging market economies. Their finding suggests that real exchange rate volatility aids in absorbing shock and limiting output volatility, but too much volatility in the exchange rate increases output volatility.

2.5 Theoretical Framework

The exogenous theory was adopted for this study. The exogenous growth model, also known as Solow's Theory, is used in this study. To characterise economic growth, one of the most popular models in economics is Solow's theory. In the model, total factor productivity results can lead to a country's standard of living increasing at an infinite rate. Solow's economic growth model introduced labour as a factor of production and capital output ratios that were not set as in Harrodmodel. Domar's According to the Economic Growth Model, the total amount of GDP is determined by factors such as population growth, technological advancement, and consumer spending. It is possible to achieve full employment in this model, with an overall output that shows consistent returns to scale. Solow (2002) combined the supply and demand sides of the economy when analysing the Balami (2006) economic growth cycle. He maintained that the supply side of neoclassical economics, which asserts $Q = f(K, L)$, is the best way to look at economic growth. This has led to it being referred to as the "neoclassical" growth model. Exogenous growth or a technological standard would be applied exogenously to the labour force, according to his theory. When it comes to long-term economic stability, Solow's model states that technological advancement is the only means for sustained growth in the economy. Changes in saving and population increase, according to his theories, have only long-term level effects. Notably, Solow's model implies that developing countries should grow quicker and eventually overtake more developed ones. According to Robert M. Solow's article published in 1957, the United States' economic growth is primarily driven by technological advancement, not land, capital, or labour (Solow 1957). The exogenous growth model was used to explain the interaction foreign exchange volatility and

its consequences on economic growth in Nigeria using the model explanation

Solow's growth model is based on three equations. He first assumes that output is a function of both capital and labour (Solow 1956, p. 66).

$$Y = F(K, L) \text{ for } K, L > 0 \tag{6a}$$

In intensive form per effective labour, equation (6a) is represented as:

$$Y = Lf(k) \text{ for } k = K/L \tag{6b}$$

To solve two unknowns, Solow assumes the rates of change for K and L overtime to be the following. For capital

$$\frac{dK}{dt} = k = Sy \tag{7a}$$

Alternatively from equation (6b) using the product rule, $K = Kl + kL$ (7b)

The labour force grows exponentially given by the following labour function

$$\frac{dL}{dt} = L = \lambda L \text{ for } \lambda > 0 \tag{7c}$$

The Solow growth model is therefore solved as follows, substituting equation (6b), (7b), and (7c) into (7a)

$$kL + k\lambda L = sLf(k) \tag{8a}$$

Dividing equation (8a) throughout by L and solving for k, we get the fundamental equation of the Solow growth model

$$k = sf(k) - (\lambda + \delta)k \tag{8b}$$

In the Solow growth model, the optimal growth path, where output, consumption and capital are maximized, will be at the intersection where $sf(k) = (\lambda + \delta)k$. The long-run growth rates are determined by exogenous elements in a closed economy. The transitional dynamics of the Solow growth model allows the growth path to converge to some optimum level even when exogenous shocks (s, λ) are experienced within the economy (Barro and Sala-i-Martin 2005, pp. 37–40). The strength of the Solow growth model, unlike the Domar model, depends on its convergence whenever there is an external shock. Solow argues that shifts in the production function caused by increases (or decreases) in the rates of savings, population growth and technological progress have temporal level effects. Once the shifts to the balanced growth path are made, the economy returns to its steady state growth path. For savings in a closed economic setting, there is a limit to which households can save their income for future consumption. Similarly, there is a limit to how much a population can grow or decrease. Solow's model proposition argues that it is only technological progress that would continue to generate level-effect economic growth in the long-run per capita income and consumption. As such, technological progress in the Solow neoclassical growth model is the only source of sustained long-run growth of per capita income (Solow 1956), and a source of international productivity differences. Because Solow's growth model is designed in a closed economic setting, this implies that the rate of growth driven by technology is

determined outside his model and is independent of any government policy intervention that may be instituted.

3. Research Methodology

Expos factor research design was adopted for this study. The model to capture the foreign exchange rate volatility on economic growth in Nigeria are stated below with the independent variables as Exchange Rate Volatility, Foreign Direct Investment, Foreign Trade Balance, International Oil Price in Naira, External Reserve, Inflation, Money supply, Interest Rate, while the dependent Variable is Gross Domestic product growth rate.

This is expressed functionally as GDP

The operational and log form of the model is stated thus:

$$GDP = \beta_0 + \beta_1 \log FDI + \beta_2 \log FTB + \beta_3 \log IOP + \beta_4 \log EXR + \beta_5 \log INF + \beta_6 \log MS + \beta_7 \log ITR + \mu_t \quad (3.1)$$

Where:

GDP= Gross Domestic Product Growth Rate.

ERV= Exchange Rate Volatility.

FDI= Foreign Direct Investment.

FTB= Foreign Trade Balance.

IOP = International Oil Price.

EXR = External Reserve.

INF = Inflation Rate

MS= money supply (captured by M₂)

ITR= Interest Rate

μ_t = stochastic error term.

The model is represented mathematically to define the dependent and independent variable as indicated in the equation

$$GDP = \beta_0 + \beta_1 \log FDI + \beta_2 \log FTB + \beta_3 \log IOP + \beta_4 \log EXR + \beta_5 \log INF + \beta_6 \log MS + \beta_7 \log ITR + \mu_t \quad (3.2)$$

Where β_0 = the intercept or the constant.

β_1, β_2 = the co-efficient of the explanatory variable.

μ_t = stochastic error term.

4. Results and Discussion

Descriptive Statistics

Table 4.1: Descriptive Statistics of Variables

	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min.</i>	<i>Max.</i>
Gross Domestic Product Growth Rate (GDP)	34	21.21	15.07	5.59	75.27
Exchange Rate Volatility (EVAT)	34	22.78	21.11	0.04	66.55
Foreign Direct Investment (FDI)	34	1.25	0.90	-0.83	2.90
Foreign Trade Balance (FTB)	34	28.86	9.74	8.72	42.93
International Oil Price (OPN)	34	12.50	5.85	2.68	28.70
External Reserve (RES)	34	23.36	1.21	20.90	24.70
Money Supply (MS)	34	7.88	2.18	3.82	10.78
Inflation Rate (INF)	34	18.51	16.60	0.22	76.75
Interest Rate (INT)	34	18.06	3.74	11.48	29.8

Source: Author's Computation using Stata 16

Gujarati (2003) defines μ_t as a random variable that has well defined probabilistic properties. The μ_t stochastic error term represent other determinants of economic growth not explicitly taken into account by the above model.

The apriori expectation:

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8 > 0; \beta_4 < 0$$

Estimation Procedure

Unit root

It is used to test for the stationarity of the time series data. Augmented Dickey fuller will be used in the process. In considering the levels the data could be said to be integrated of order 1 which is often denoted as I(1) or 2 represented by I(2).

The null hypothesis is that $\alpha_I = 0$. If the null hypothesis $\alpha_I = 1$, then we conclude that the series under consideration $\Delta(y_t)$ has a unit root and is therefore non-stationary. If the ADF test fails to reject the test in levels but rejects the test in first differences, then the series contains one unit root and is of integrated order one I (1). If the test fails to reject the test in levels and first differences but rejects the test in second differences, then the series contains two-unit roots and is of integrated order two I(2).

The Philip-Perron (PP) Unit Root Test is implemented to justify the results of ADF test. The equation is thus:
 $\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \epsilon_t$

$$3.4$$

The result emanating from the model is evaluated based on the following criteria: Economic, Statistical and Econometric Criteria.

Sources of Data The dataset for this study is from secondary source and obtained from the Central Bank of Nigeria's Statistical Bulletin and the National Bureau of statistics. The period of the study is from 1990- 2021 inclusive, an annual data of 33 years.

The table presented provides descriptive statistics for various macroeconomic variables over a sample of 34 observations. The variables include the Gross Domestic Product Growth Rate (GDP), Exchange Rate Volatility (EVAT), Foreign Direct Investment (FDI), Foreign Trade Balance (FTB), International Oil Price (IOP), External Reserve (RES), Money Supply (MS), Inflation Rate (INF), and Interest Rate (INT). The table reports the mean, standard deviation, minimum, and maximum values for each variable, offering insight into the central tendency, dispersion, and range of these economic indicators.

The average GDP growth rate is 21.21%, indicating a relatively high growth period in the sample. This suggests robust economic activity, although the standard deviation of 15.07% highlights significant fluctuations in growth rates across different periods. High GDP growth is typically associated with increased production, employment, and income levels, contributing positively to economic development. However, the high standard deviation may indicate periods of volatility and economic uncertainty, which can affect investor confidence and long-term economic planning.

The average exchange rate volatility is 22.78, with a standard deviation of 21.11, reflecting considerable fluctuations in the exchange rate over time. High exchange rate volatility can create uncertainty in international trade and investment decisions. It may lead to increased costs for businesses involved in international transactions, potentially reducing foreign investment and trade volumes. Additionally, it could affect inflationary pressures if the exchange rate fluctuations lead to higher import costs.

The mean FDI is 1.25%, with a standard deviation of 0.90%, indicating a relatively stable inflow of foreign investment during the period studied. Steady FDI inflows suggest investor confidence in the economy's stability and growth prospects. However, the relatively low mean FDI may indicate that there are structural challenges or barriers that need to be addressed to attract higher levels of foreign investment, which is crucial for technology transfer, job creation, and economic growth.

The mean of FTB is 28.86, with a standard deviation of 9.74, indicating a consistent surplus in the trade balance. A positive trade balance suggests that the country is exporting more than it is importing, contributing positively to GDP. However, reliance on trade surpluses might expose the economy to external shocks, such as changes in global demand or

commodity prices, particularly if the exports are not diversified.

The average international oil price is 12.50, with a standard deviation of 5.55, reflecting the volatility in global oil markets. As an oil-exporting country, fluctuations in international oil prices can significantly impact the economy. Higher oil prices may boost export revenues and improve the trade balance, while lower prices could lead to budget deficits and reduced foreign exchange reserves. The economy's dependency on oil underscores the need for diversification to mitigate the risks associated with oil price volatility.

The mean external reserve is 23.36, with a standard deviation of 1.21, indicating relatively stable reserves during the period. Sufficient external reserves provide a buffer against external shocks, support currency stability, and enhance the country's ability to meet its international obligations. The stability in reserves suggests prudent fiscal and monetary policies, although continuous monitoring is essential to maintain this stability, especially in volatile global economic conditions.

The average money supply is 7.88, with a standard deviation of 2.18, indicating moderate growth in the money supply. Growth in money supply can stimulate economic activity by making more funds available for investment and consumption. However, excessive growth in money supply without corresponding growth in output can lead to inflationary pressures, reducing the purchasing power of consumers and potentially destabilizing the economy.

The average inflation rate is 18.51%, with a standard deviation of 16.60%, indicating periods of high inflation. High and volatile inflation can erode purchasing power, distort investment decisions, and lead to uncertainty in the economy. Persistent inflation can also lead to higher interest rates, which may stifle economic growth. Managing inflation effectively is crucial for maintaining economic stability and fostering sustainable growth.

The mean interest rate is 18.06%, with a standard deviation of 3.74%, indicating relatively high borrowing costs. High interest rates can deter investment and consumer spending, potentially slowing economic growth. However, they may also be necessary to control inflation and maintain price stability. The balance between maintaining affordable credit and controlling inflation is a critical challenge for policymakers.

Unit Root Test

This study conducted a test of order of integration for each variable using Augmented Dickey-Fuller (ADF). This is to ensure that the variables are stationary as coefficients of regression derived from such non-stationary variables will be spurious and deceptive. The results of the unit root test are presented below.

Result of the Unit Root Test

Table 4.2: Unit Root Test

Variable	Augmented Dickey Fuller test		Summary
	Level	1 st Difference	
Gross Domestic Product Growth Rate (GDP)	-1.78	-4.57**	I(1)
Exchange Rate Volatility (EVAT)	-0.52	-3.66**	I(1)
Foreign Direct Investment (FDI)	-1.32	-1.71**	I(1)
Foreign Trade Balance (FTB)	-0.85	-2.80**	I(1)
International Oil Price (IOP)	-1.46	-2.35**	I(1)
External Reserve (RES)	1.10	-2.42**	I(1)
Money Supply (MS)	6.66**	-	I(0)
Inflation Rate (INF)	-1.14	-3.98**	I(1)
Interest Rate (INT)	-1.18	-5.53**	I(1)

Source: Author's Computation, using Stata 16

The ADF test statistic at the level is -1.78, which is higher than the critical values at conventional significance levels, indicating that GDP is non-stationary at its level. The ADF test statistic at the first difference is -4.57**, which is lower than the critical values, indicating stationarity at the first difference. GDP is integrated of order 1, denoted as I(1), meaning it becomes stationary after differencing once.

The ADF test statistic at the level is -0.52, indicating non-stationarity at the level. The ADF statistic at the first difference is -3.66**, showing that EVAT becomes stationary after the first difference. EVAT is also I(1), requiring first differencing to achieve stationarity.

The ADF test statistic at the level is -1.32, suggesting that FDI is non-stationary. At the first difference, the ADF statistic is -1.71**, which still might not reach stationarity depending on the critical value used. FDI is I(1), indicating it is stationary after first differencing. The ADF statistic at the level is -0.85, indicating non-stationarity. The statistic at the first difference is -2.80**, confirming stationarity after differencing. FTB is I(1), becoming stationary after the first difference.

The level ADF statistic is -1.46, indicating non-stationarity. The first difference statistic is -2.35**, showing stationarity at the first difference. The level statistic is 1.10, suggesting non-stationarity. The ADF statistic at the first difference is -2.42**, indicating stationarity. The ADF statistic at the level is 6.66**, which is significant, indicating stationarity. The ADF statistic at the level is -1.14, indicating non-stationarity. The ADF statistic at the first difference is -3.98**, confirming stationarity. The ADF statistic at the level is -1.18, indicating non-stationarity. The ADF statistic at the first difference is -5.53**, confirming stationarity.

Most of the variables in the analysis are non-stationary at their levels, as indicated by their ADF test statistics, but become stationary after first differencing. This means they follow a random walk and only become stable after removing trends. Economically, this suggests that these variables are influenced by external shocks that have lasting effects over time. For accurate modeling and forecasting, these variables need to be differenced to avoid misleading conclusions in regression analysis. The fact that variables like GDP, FDI, EVAT, and others are I(1) implies that policies targeting these areas should consider the persistence of shocks over time. For instance, a temporary shock to GDP growth or FDI might have prolonged effects, necessitating long-term policy interventions rather than short-term measures.

The stationarity of the Money Supply (MS) at level implies that its effects are immediate and do not exhibit prolonged persistence. This characteristic suggests that monetary policy changes could have more immediate effects on economic conditions, as adjustments in money supply do not lead to long-term trends but rather immediate shifts. Both inflation (INF) and interest rates (INT) being I(1) suggest that these variables are prone to persistent shocks, which can complicate monetary policy efforts aimed at stabilizing the economy. Persistent inflation might require sustained

intervention, while interest rates being I(1) indicates that changes in policy rates might have long-term impacts on the economy. Variables such as international oil prices (IOP) and exchange rate volatility (EVAT) being I(1) highlight the vulnerability of the economy to external shocks. Policies aimed at economic stabilization must take into account the potential for prolonged effects of external shocks on these variables.

Long run estimation of the model.

The long run analysis is carried out on the model and the result is presented in Table 4.6.

Table 4.3 LONG RUN Estimation of the model

Long Run Estimation Results				
Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EVAT	-0.12	0.07	-1.54	0.14
FDI	3.01	2.09	1.44	0.17
FTB	0.99	0.32	3.03**	0.00
OPN	-2.90	1.07	-2.71**	0.01
RES	1.02	3.84	0.27	0.79
MS	-8.60	3.15	-2.73**	0.01
INF	0.85	0.16	5.22**	0.00
INT	-1.22	0.90	-1.36	0.19
Short Tun Estimation Results				
D(EVAT)	-0.25	0.13	-1.91**	0.07
D(FDI)	-6.30	2.04	-3.08**	0.00
FTB	-101	0.24	-4.17**	0.00
OPN	2.94	0.54	5.36**	0.00
RES	6.46	4.08	1.58	0.13
MS	-22.66	12.35	-1.83***	0.08
INF	-0.84	0.16	-4.96**	0.00
INT	-1.38	0.56	2.47**	0.02
C	88.52	88.73	1.00	0.33
R-squared = 0.95				
Adj-R-squared = 0.90				

Source: Authors Computation using Stata 16

In the long run, exchange rate volatility has a negative but statistically insignificant impact on GDP growth. The coefficient of -0.12 indicates that a 1% increase in exchange rate volatility would reduce GDP by 0.12%. However, the impact is not statistically significant, implying that exchange rate volatility might not have a strong direct effect on long-term GDP growth in the economy under study. Foreign Direct Investment (FDI) has a positive relationship with GDP growth in the long run. A 1% increase in FDI could lead to a 3.01% increase in GDP. However, this relationship is not statistically significant, suggesting that while FDI is expected to boost economic growth, other factors may be influencing its impact, and its effect may not be consistent over time. The foreign trade balance has a significant positive impact on GDP growth in the long run. A 1% improvement in the trade balance is associated with a 0.99% increase in GDP. This result indicates that a strong trade balance, possibly through export growth or reduced imports, is crucial for sustaining long-term economic growth. International oil prices negatively affect GDP growth in the long run, with a statistically significant coefficient of -2.90. A 1% increase in oil prices could

reduce GDP by 2.9%, reflecting the potential economic challenges faced by oil-importing countries when oil prices rise, leading to higher production costs and reduced consumer spending. External reserves have a positive but statistically insignificant impact on GDP growth. A 1% increase in reserves is associated with a 1.02% increase in GDP, but the lack of statistical significance suggests that while reserves are important for economic stability, they may not directly drive long-term growth in this context. The money supply has a significant negative impact on GDP growth in the long run. A 1% increase in the money supply is associated with an 8.60% reduction in GDP. This suggests that excessive money supply growth, possibly leading to inflation or currency devaluation, could be detrimental to long-term economic growth.

Inflation has a significant positive impact on GDP growth in the long run. A 1% increase in inflation could increase GDP by 0.85%. This counterintuitive result might suggest that mild inflation can stimulate economic activity, possibly by encouraging spending rather than saving. However, this relationship must be managed carefully to avoid hyperinflation. Interest

rates have a negative but statistically insignificant impact on GDP growth. A 1% increase in interest rates could reduce GDP by 1.22%. While the result suggests that higher borrowing costs might dampen economic activity, the lack of statistical significance means this relationship is not strongly supported in the long-term analysis.

The long-run results show that factors like the trade balance, international oil prices, money supply, and inflation have statistically significant impacts on GDP growth, with varying signs. However, not all factors, like FDI and interest rates, show significant long-term effects, indicating the complexity of these relationships over time.

Short run estimation of the model.

In the short run, exchange rate volatility has a negative impact on GDP growth, but the relationship is only marginally significant ($p = 0.07$). This suggests that sudden changes in exchange rates can disrupt economic growth in the short term, potentially due to uncertainty and its effects on trade and investment. Surprisingly, in the short run, FDI has a significant negative impact on GDP growth. A 1% increase in FDI could lead to a 6.30% decrease in GDP. This could be due to the initial adjustment costs or the crowding out of domestic investment in the short term.

The trade balance has a significant negative impact on GDP growth in the short run. A 1% improvement in the trade balance could reduce GDP by 1.01%, which might indicate that trade balance improvements could be associated with reduced domestic consumption or investment in the short term. In the short run, international oil prices have a positive and significant impact on GDP growth. A 1% increase in oil prices could increase GDP by 2.94%. This could be due to the immediate benefits for oil-exporting countries or sectors dependent on oil prices.

External reserves have a positive but statistically insignificant impact on GDP growth in the short run. The coefficient suggests that an increase in reserves might boost economic growth, possibly by stabilizing the economy, but the result is not strong enough to be conclusive. The money supply has a significant and large negative impact on GDP growth in the short run. A 1% increase in money supply could decrease GDP by 22.66%, which might reflect short-term inflationary pressures or instability caused by rapid changes in the money supply. Inflation has a significant negative impact on GDP growth in the short run. A 1% increase in inflation could reduce GDP by 0.84%. This result is consistent with the adverse effects of inflation on purchasing power and

economic stability in the short term. Interest rates have a significant negative impact on GDP growth in the short run. A 1% increase in interest rates could decrease GDP by 1.38%, reflecting the typical short-term effects of higher borrowing costs on economic activity.

The short-run results highlight the immediate impacts of economic variables on GDP growth, with most factors having significant effects. Notably, the negative impacts of FDI and money supply in the short run suggest possible adjustment challenges or inflationary pressures. Overall, these results provide valuable insights into the dynamics of GDP growth, emphasizing the importance of considering both short-term and long-term perspectives in economic policy and decision-making.

Test of Hypothesis One

H_0 : There is no significant impact of foreign exchange volatility on economic growth of Nigeria.

To test the hypothesis that:

$H_0: \beta_1 = \beta_2 = 0$ i.e. all slope coefficients are simultaneously zero.

$H_1: \beta_1 \neq \beta_2 \neq 0$ i.e., not all slope coefficients are simultaneously zero.

The study used probability of the T-stat regression estimate to ascertain the significance effect of foreign exchange volatility and economic growth of Nigeria.

Decision Rule: If the probability of the foreign exchange volatility obtained from the T-stat result is less than 5% level of significance, the study would reject the null hypothesis, H_0 and accept the alternate hypothesis H_1 .

Foreign exchange volatility with T-statistics of -1.54 and a p-value of 0.14 is statistically not significant in the long run, while it is statistically significant in the short run. The study accepted the null hypothesis and therefore concludes that foreign exchange volatility has no significant effect on economic growth in Nigeria.

5. Policy Implication of Result

Given the findings related to the foreign exchange volatility on economic growth in Nigeria, several policy implications can be drawn to guide economic strategy and planning:

- The lack of heteroscedasticity implies that the volatility of key economic variables, such as GDP, is stable over time. Policymakers

can be confident that large economic shocks will not lead to periods of heightened uncertainty. This stability is critical for designing long-term economic policies, as it suggests that the economy is less vulnerable to volatile swings in risk or uncertainty.

- Given this stability, policymakers can focus on growth-oriented policies without the immediate need to create buffers for unpredictable spikes in volatility. For instance, investments in infrastructure, education, or healthcare can be pursued with reduced concern for unexpected economic instability that might arise from shocks.

6. Policy Recommendations

Based on the findings regarding the impact of foreign exchange volatility on economic growth in Nigeria, the following recommendations were proposed:

- Policymakers should prioritize addressing systemic issues contributing to the volatility of exchange.
- Government should make policy that will reduce the effect of Inflation was on economic growth of Nigeria.

In light of these findings, it is imperative for policymakers in Nigeria to prioritize measures aimed at addressing the foreign exchange volatility to ensuring the stability of inflation and ensuring the existence of balanced trade if not a surplus balance.

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Development and Optimization of a Comprehensive Data Framework for Cervical Cancer Diagnosis

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Abstract. A global public health menace, cervical cancer is a major public health problem worldwide. Persistent infection with high-risk types of human papillomavirus (HPV) is the primary cause of the disease. Moreover, timely and accurate diagnosis is essential for clinical intervention, but socio-economic and health care system-related factors often preclude effective screening. Current solutions like Pap smears and HPV tests are not perfect or accessible to all regions and in fact, can lead to false positive or negative outcomes. We implement aggregation of both primary health care data as well as secondary datasets obtained from platform sources to create a strong framework for cervical cancer diagnosis. By palpably extended dataset in this way, it reduces the generalizability of machine learning diagnostic models that often grapples with the problems faced in real-world healthcare data like missing items component be afflicted with time few, outlier, and feature scale 250. This data cleansing helps ensure that predictive modeling can proceed without a risk of misleading results; outliers and missing data points are thus handled through systematic approaches such as outlier detection, missing data imputation, and data normalization. Evaluated five classification algorithms based on accuracy, precision, recall and f1 score Logistic Regression, SVM, KNN, Random Forest and Decision Trees The finding showed that Logistic Regression, SVM and KNN (your classifier) have better performance metrics and achieve an accuracy of 86% with lower recall on random forest and decision tree models. This work illustrates it is indeed possible to use an optimized data framework to improve the detection of cervical pathology through machine learning. Although significant advancements were made, the ongoing quest for improved

sensitivity and the investigation of hybrid modeling approaches are crucial. Further studies should concentrate on improving the performances of less powerful models and use of more sophisticated data-analytical methods to guarantee that screening strategies provide timely and accurate diagnoses. Performing exploratory data analyses to discover relevant predictive features, using domain knowledge to narrow features of interest, based on the results of the study.

Keywords: Cervical Cancer, Data Framework, Machine Learning, Diagnostic Model, Data Integration, Electronic Health Records (EHR) and Human Papillomavirus (HPV)

1. Introduction

Cervical cancer is an important public health problem globally, ranking fourth among cancers in women (Sung et al., 2021). The estimated 604,000 new cases and 342,000 deaths in 2020 (WHO, 2022) underscore the need for efficient early detection and intervention approaches. Persistent infection with high-risk genotypes of human papillomavirus (HPV) underlies the disease, though a number of socio-economic and health-system factors impact timely diagnosis (Kumar et al., 2020) Such complexities can only be addressed by a holistic approach that comprises sound data collection, as well as pre-processing and quality improvement methodologies to support the correct diagnosis and increased patient outcomes. Traditionally, cervix cancer screening is done clinically using Pap smear and HPV testing. Alternative approaches have emerged that avoid some of the pitfalls of cervical screening, but are not without

their own complications such as false positive/false negative cases and inequitable access to care (Liu et al., 2020) Novel data analytical and machine learning techniques are highly promising for prediction/counterfactual reasoning of all types and can have sweeping impacts up and down the cervical cancer screening pipeline, from identification to acceleration. Machine learning algorithms can mine vast amounts of data to find patterns that the human clinician is likely to miss and yield more accurate diagnosis and risk stratification among patients. [Gupta and Dutta, 2021]

Why Using A Data Framework That Is Optimized To Process Data From Primary And Secondary Sources Is Beneficial? It has two benefits: One it increases the size of the dataset making it more representative of the population which increases the generalizability of diagnostic models. On top of that, secondary datasets like those that are already available for download in Kaggle provide several cases that could complement the clinical data obtained from the health facilities (Bokhman, 2021). These datasets enable cross-validation of results and allow insights into population-specific trends and symptoms related to cancer. Second, real-world healthcare data captures more variability than is often the case in traditional experiments, introducing complex data quality challenges that must be resolved prior to analysis through careful preprocessing (Zhang et al., 2020). Missing data, outliers, and differences in scales between features distract the view from important patterns behind them, and the resulting inference is not accurate. This data framework leverages outlier detection, missing value imputation, and data normalization techniques to dramatically improve data cleanliness and ensure predictive models can't produce garbage results.

Moreover, with the availability of EHR, genomic, and socio-demographic data, the paradigms of cervical cancer diagnosis are evolving rapidly. It is the challenge of managing how to integrate these heterogeneous data sources into a cohesive data framework while maintaining data integrity by following ethical standards and regulations of privacy (Bradley et al., 2019). Particularly data in the health sector is an indispensable treasure trove, but understanding the value of data and ensuring this information is utilized in compliance with data privacy standards is a very important aspect. Cervical cancer is regarded as one of the greatest public health challenges worldwide, with an estimated 604,000 new cases and 342,000 deaths globally in 2020; it is also the fourth most common human cancer among women worldwide (Sung et al., 2021; Eng et al., 1995).

Approximately 90% of cervical cancers develop due to the chronic infection of high-risk human papillomavirus (HPV) types and other risk factors have also been identified in the cervical cancer development such as smoking, prolonged use of oral contraceptives and immunosuppression (Kumar et al., 2020; WHO, 2021). Only a comprehensive diagnostic approach based on a wide variety of clinical data can accommodate the multifactorial pathways of causation in order to refine the definition of high-risk populations.

The classic methods of cervical cancer screening have included Pap smears and HPV tests. Next to the very significant reduction of the incidence of cervical cancer and mortality associated with cervical cancer that has been achieved in developed countries in recent decades through such efforts, such programs are not yet available, or in some cases have not been successfully implemented in high burden low- and middle-income settings (Liu et al., 2020). Furthermore, these types of screening methods can also cause false-positive and false-negative results leading to unnecessary anxiety or delayed treatment (Gupta & Dutta, 2021). This underlines the urgent necessity for enhanced diagnostic strategies integrating data analytical and machine learning techniques.” The use of big data and sophisticated analytics is revolutionizing the diagnosis and treatment of diseases in the last few years. Healthcare information is produced from diverse inputs such as electronic health records (EHRs), imaging studies, laboratory test results, and genomic test readings over the course of a patient’s life. This large amount of data has created a tremendous opportunity to develop predictive models that can be used to identify high-risk individuals in increasingly accurate ways when it comes to the ability to predict cervical cancer risk (Bradley et al., 2019) They can also use new methods like machine learning, for instance, which can work with a greater potential of data sets and detect more complicated correlations that could not be caught with standard techniques. Advanced algorithms trained on demographic, clinical, and molecular data can help improving early stages detection systems and improve prognosis in patients (Kemp et al., 2022).

The need for a generalized data framework for cervical cancer diagnosis cannot be stressed enough. This makes it easier to analyse and process disparate data sources, which are critical in constructing accurate predictive models. The analytical dataset is a powerful combination of (1) proprietary data from healthcare organizations and (2) secondary (or bundled/easy to access) data from open information-centric resources like Kaggle (Bokhman, 2021).

Incorporating heterogeneous data types introduces variance to the dataset, improving external (to the population) applicability and greatly enhancing sensitivity for subtle inter-group differences indicative of potentially underlying cervix cancers. However, raw healthcare data often has a host of quality issues, which can endanger the efficacy of predictive modelling. According to Zhang et al. (2020) that a significant amount of data is having missing values, there are wrong details in the entries and there are inconsistencies due to the usage of different approaches to collect the data. Therefore, some substantial preprocessing must be done to improve the quality of the datasets in order to make the data suitable to apply machine learning. Any data framework being very precise, systematic with proper techniques, assures that clean & reliable data is be used for futuristic output which is a lot more to solve these mainstream challenges.

2. Materials and Methodology

Hardware Requirement

Computing Resources, a high-performance computing system with the following specifications or hardware requirements is needed or highly recommended, for the strengthening of the machine learning model for cervical cancer diagnosis tasks.

CPU: A multi-core Central Processing Unit (CPU) with a minimum of 4-6 cores and a high clock speed of at least 1.5 GHz is recommended for most machine learning algorithms including that of strengthening machine learning for cervical cancer diagnosis. In this research work 2.9 GHz was used.

Memory: To maintain a better performance of the machine learning algorithms a minimum of 8 GB of RAM is required, but 16 GB is the average memory required, for a better and more accurate system above 16 GB RAM is highly recommended, especially for large datasets. Memory plays roles in data preprocessing tasks, data analysis, visualization, model training, and other machine learning techniques. In this research work 8 GB RAM was used.

Storage: Secure, encrypted storage systems were used to store all data, ensuring compliance with data protection regulations. A fast storage drive such as SSD or HDD with at least 256GB SSD and 512 GB HDD of storage was highly recommended for storing datasets, data preprocessing and analysis, and model weights. In this research work 500 GB SSD was used.

GPU: A dedicated graphics processing unit (GPU) with a high number of CUDA cores (at least 4 GB of

VRAM) is recommended for deep learning models and large-scale machine learning tasks. Popular options include NVIDIA GPUs (e.g., GeForce, Quadro, or Tesla).

Software

The software, libraries and frameworks are listed in the following subheadings.

Programming Languages

Python was the primary programming language used for data analysis and model development due to its extensive libraries and community support. Python was used.

Libraries and Frameworks

Key libraries and frameworks used in this study include:

Scikit-learn: A popular Python library used for various Machine learning tasks such as time series forecasting, classification, regression clustering, and many more which is the most widely used for implementing these traditional machine learning algorithms and evaluation metrics of the algorithms.

Pandas: is among the most widely used Python libraries and the most powerful ones, for it is data manipulation, preprocessing, and analysis capabilities and it is the ability to handle and manage large structure datasets, is what makes it useful to employ in most of the machine learning processes. Pandas library can be utilized for data preprocessing tasks, exploratory data analysis, visualization, and many more.

NumPy (Numerical Python): is a library for working with arrays and mathematical operations in Python. It is a fundamental package for scientific computing and data analysis. With the help of Numpy, you can do all your numerical computations.

Matplotlib and Seaborn for data visualization: Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python. It provides a wide range of visualization tools, including, Plots like, Line plots, scatter plots, bar plots, histograms, heatmaps, and more, Charts such as Pie charts, box plots, violin plots, and others, also Visualizations like 2D and 3D plots, contour plots, and streamlines as well as Customization that is an extensive option for customizing colors, fonts, labels, and layouts. Seaborn is a visualization library built on Matplotlib, focusing on statistical graphics and data visualization. It provides a high-level interface for creating informative and attractive statistical graphics.

Development Environment

Jupyter Notebook was used due to its widely application in the machine learning (ML) community for it is flexibility and several capabilities offered to the developer for easy and successful model development, some of these capabilities are, interactive environment, data exploration, and visualization, experimentation, documentation and collaboration, reproducibility as well as integration with various machine learning libraries and tools and many among others. Jupyter Notebooks is an essential tool for ML model development that supports the entire workflow from data preprocessing to model evaluation and documentation. Finally, Jupyter Notebooks are also used for writing and testing code, facilitating an interactive and iterative approach to model development.

Models Design

Machine learning models to improve the accuracy of cervical cancer diagnosis where designed. This design is appropriate as it allows for the manipulation of different model parameters and the assessment of their impact on diagnostic performance. The primary goal is to develop a machine learning model, that strengthens the performance of cervical cancer diagnosis, and the primary question that needs to be addressed is, how can machine learning models be enhanced to improve the diagnosis of cervical cancer?

Figure 3.1 illustrates the overall approach used in this study, which starts from data collection, preprocessing, model training, and evaluation.

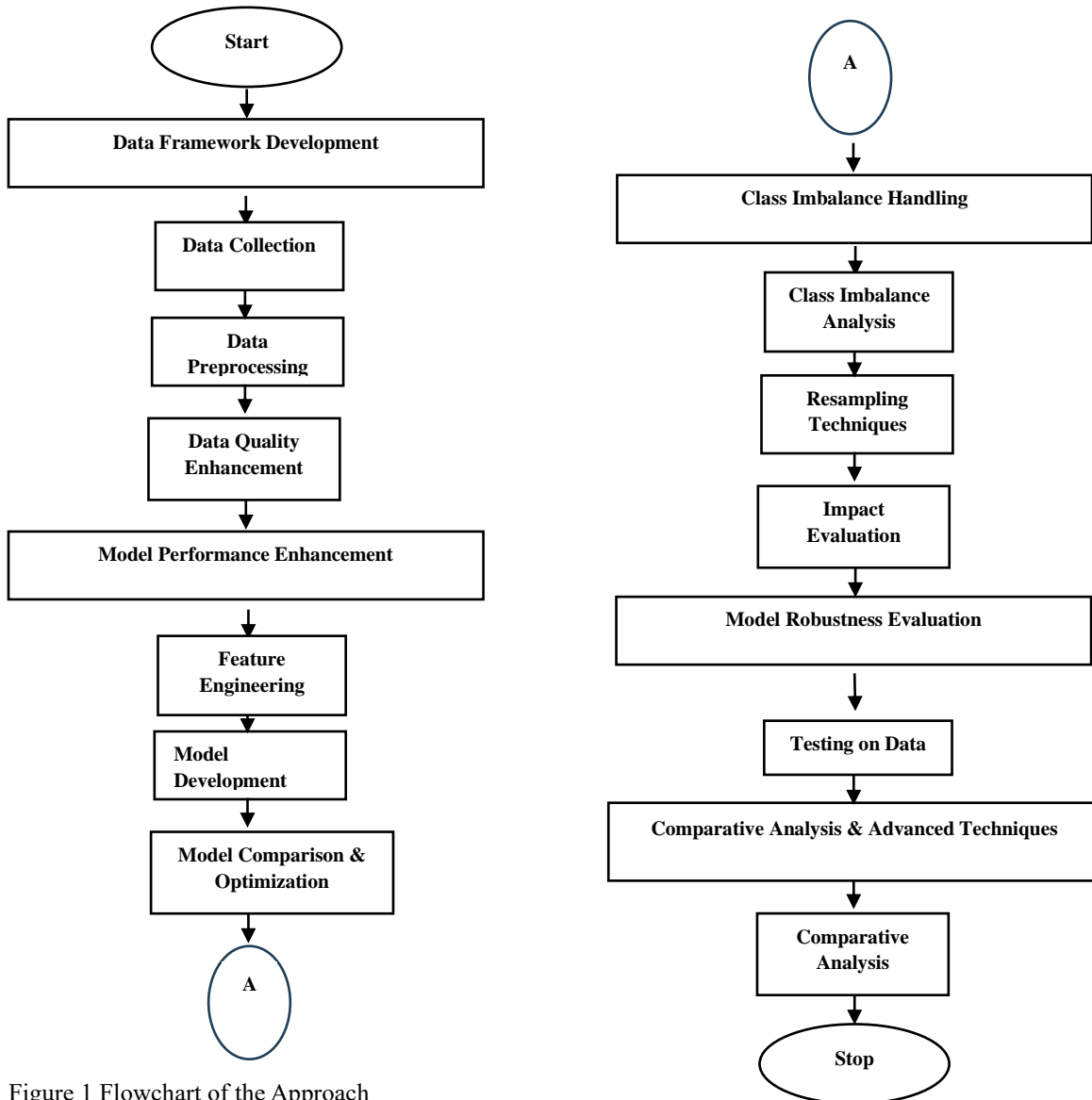


Figure 1 Flowchart of the Approach

Experimental Results

The comprehensive outcomes of the experimental study aimed at developing an effective cervical cancer diagnosis model using various machine learning algorithms. The results demonstrate how the proposed model was developed, implemented, and tested, ensuring its efficacy, reliability, and workability.

Model Performance Metrics

The performance of five classification algorithms was evaluated based on key metrics: accuracy, precision, recall, and F1-score. The findings indicate that Logistic Regression, Support Vector Machine (SVM), and K-Nearest Neighbors (KNN) achieved the highest performance metrics overall.

Table 1: Performance Metrics of Classification Algorithms

Model	Accuracy	Precision	Recall	F1-Score
Logistic Regression	0.86	0.86	0.75	0.80
Support Vector Machine	0.86	0.86	0.75	0.80
K-Nearest Neighbor	0.86	0.86	0.75	0.80
Random Forest	0.81	1.00	0.50	0.67
Decision Tree	0.81	0.83	0.63	0.71

From Table 1, it is evident that Logistic Regression, SVM, and KNN achieved a commendable accuracy of 86%. The Random Forest model demonstrated 100% precision but fell short with reduced recall at 50%, while the Decision Tree had moderate performance indicators.

Confusion Matrix Insights

The confusion matrix serves as a vital tool to elucidate the classification outcomes. For instance, the Logistic Regression model's confusion matrix results are represented in Table 2.

Table 2: Logistic Regression Values for the Confusion Matrix

	Predicted: No Cancer	Predicted: Cancer
Actual: No Cancer	True Negatives (TN) = 21	False Positives (FP) = 4
Actual: Cancer	False Negatives (FN) = 9	True Positives (TP) = 26

Key Metrics Calculated from the Confusion Matrix of the Logistic Regression:

- Accuracy: 78.3%
- Sensitivity (Recall): 74.2%
- Specificity: 84%
- Precision: 86.6%

This analysis reveals that the logistic regression model correctly classifies 78.3% of the cases, indicating a potential risk in failing to detect 25.8% of actual cancer cases, which is clinically significant.

Support Vector Machine Results

The SVM model recorded similar metrics to Logistic Regression, illustrating its utility:

Table 3: SVM Values for the Confusion Matrix

	Predicted: No Cancer	Predicted: Cancer
Actual: No Cancer	True Negatives (TN) = 21	False Positives (FP) = 4
Actual: Cancer	False Negatives (FN) = 9	True Positives (TP) = 26

Accuracy: 78.3%
 Sensitivity (Recall): 74.2%
 Specificity: 84%
 Precision: 86.6%

The insights from both models underscore that SVM performs robustly, though it also faces the challenge of false negatives.

Random Forest and Decision Tree Results

The Random Forest model yielded notable outcomes:

Table 4: Random Forest Values for the Confusion Matrix

	Predicted: No Cancer	Predicted: Cancer
Actual: No Cancer	True Negatives (TN) = 21	False Positives (FP) = 0
Actual: Cancer	False Negatives (FN) = 17	True Positives (TP) = 18

Key metrics:
 Accuracy: 69.6%
 Sensitivity (Recall): 51.4%
 Specificity: 100%
 Precision: 100%

Despite its perfect specificity and precision, the Random Forest model's low sensitivity is alarming. In clinical scenarios, the ability to identify existing cancer cases is paramount. Contrastingly, the Decision Tree model demonstrated a balanced performance:

Table 5: Decision Tree Values for the Confusion Matrix

	Predicted: No Cancer	Predicted: Cancer
Actual: No Cancer	True Negatives (TN) = 14	False Positives (FP) = 4
Actual: Cancer	False Negatives (FN) = 13	True Positives (TP) = 22

Accuracy: 67.9%
 Sensitivity (Recall): 62.9%
 Specificity: 77.8%
 Precision: 84.6%

While the Decision Tree model presented adequate metrics, both sensitivity and accuracy indicate areas requiring improvement.

K-Nearest Neighbor Results

The KNN model produced results mirroring those of Logistic Regression and SVM:

Table 4.6: K-Nearest Neighbor Values for the Confusion Matrix

	Predicted: No Cancer	Predicted: Cancer
Actual: No Cancer	True Negatives (TN) = 21	False Positives (FP) = 4
Actual: Cancer	False Negatives (FN) = 9	True Positives (TP) = 26

Accuracy: 78.3%
 Sensitivity (Recall): 74.2%
 Specificity: 84%
 Precision: 86.6%

The KNN model's metrics affirm its reliability, exhibiting parallel performance characteristics to SVM and Logistic Regression, including moderate sensitivity concerns.

3. Discussion

The research highlights the advancements made in cervical cancer diagnosis through machine learning. Logistic Regression, SVM, and KNN emerged as superior classifiers, achieving an average accuracy, precision, recall, and F1-score at 86%, 86%, 75%, and 80%, respectively. These models provided effective balance and minimized false positives.

Random Forest and Decision Tree models, on the other hand, presented challenges. While Random Forest achieved excellent precision and specificity, its low recall rate categorized it as less reliable for critical diagnostic purposes, reflecting on the model's inability to identify 48.6% of positive cases. Similarly, the Decision Tree model's false positive rate could induce undue stress among diagnosed patients.

4. Comparative Improvements

Comparison with conventional methods, notably Li et al. (2021), revealed significant enhancements across all models except the Random Forest. Key improvements include:

Logistic Regression: Accuracy improved from 75% to 86%—an increase of 14.67%.

SVM: Accuracy rose from 78% to 86%, a growth of 10.26%.

KNN: Achieved comparable upticks similar to Logistic Regression and SVM.

Conversely, the Random Forest model showcased a 4.7% decline in accuracy, indicating a need for recalibration targeting improved sensitivity.

5. Conclusion and Future Directions

In conclusion, the findings underscore the effectiveness of machine learning models, with Logistic Regression and SVM identified as the most effective in cervical cancer diagnosis. However, continued refinement to improve sensitivity remains essential. These results advocate for ongoing research towards enhancing the detection capabilities of less effective models such as Random Forest and Decision Tree, positioning future studies to capitalize on the

strengths of current methodologies while addressing their weaknesses.

6. Recommendations

Therefore, the followings were Recommended for Improving Performance Metrics in Cervical Cancer Diagnosis Models:

- Utilize a larger and more diverse dataset that encompasses various populations, ethnicities, ages, and cervical cancer stages to enhance model generalizability.
- Use exploratory data analyses to ascertain what features are most indicative of an accurate prediction. Specifically, this will involve domain knowledge about cervical cancer that can lead to better feature selection.
- Adjust the decision point as required to accommodate the business need (i.e. attempting to push for upper recall values to make sure positive cases are not missed at the cost of lower precision).

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