The Role of Effective Information Dissemination in Mitigating the Effects of Fuel Subsidy Removal In Nigeria, With A Focus On Kogi State.

BY

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Abstract

This paper investigates the roles of effective information dissemination in mitigating the effects of fuel subsidy removal in Kogi State. There is a social contract between the government and the people, in a democratic system of government which implies that citizen should be well informed about challenges and the gains of this policy, to avert fake news which can cause chaos, anarchy, and other social vices that are not good for the present democratic dispensation. Fuel subsidy removal came as a shock to Kogi people after listening to the presidential broadcast of president Ashiwaju Bola Ahmed Tinubu, on the 29th May, 2023. Since the discovery of petrol in Oloibiri in the present Bayelsa state, petrol has remained the mainstay of Nigerian economy and any hike in the price of petrol always results in socio-economic hardship to the citizen. It is quite obvious in Kogi state that, since the removal of fuel subsidy, there has been drastic increase in the cost of goods and services, it is therefore necessary to create a better understanding between the government and the people using the strategy of effective information dissemination, because information is power which can clear any form of fake news and rumour mongering in relation to fuel subsidy removal. Data was collected from both primary and secondary sources using both qualitative and quantitative approaches while the samples of two hundred respondents were selected from population of three hundred and thirty-five people. Data obtained from field survey was carefully analyzed to achieve the objective of the study.

KEYWORDS: ***Effective Information Dissemination, Fuel Subsidy Removal***.

INTRODUCTION

Historically, the issue of fuel subsidy removal has been a controversial issue, which several governments in the past have attempted to remove subsidy on fuel but Nigerian resisted the policy. (Sunday 2023).

Vice President Kashim Shettima said Nigeria must get rid of fuel subsidy before it deals a deadly blow to the country. He further stated that, the President has issued pronouncements on fuel subsidy, the truth of the matter is that the poor over 80% of Nigerian benefit little. In the year 2022 the government spent $10 billion subsidizing ostentatious lifestyle of upper class of the society, so it is better for subsidy to go.

Since the removal of fuel subsidy through a national broadcast, when President Asiwaju Bola Ahmed Tinubu was sworn in as the 16th President of the Federal Republic of Nigeria on May 29th, 2023, the increase in the price of fuel has invariably results to high price for the consumers. It is quite obvious that the removal of fuel subsidy has brought a lot of hardship to not only Nigerians but other African Countries depending on Nigeria for fuel. The fact remains that fuel subsidy is gone and this is a government policy and economic reality that Nigerian need to cope with.

What is Government Policy?

To Isah (2013) government policy can be regarded as the actions and inactions of the government, it entails what the government want to do, when to do it and how to do it.

In a democratic dispensation, especially in Nigeria, policies cannot be separated from good governance, because government must formulate one policy or the other to improve the standard of living of the citizenry educationally, politically, and socially. For the policy of fuel subsidy removal to have the desired positive effects on Nigerian, it is imperative for Nigerians to be well-informed about this policy. Nigerians need to know what they stand to benefit from the policy in the long run.

In view of the above, the researchers conceived the idea of carrying out this research work on ***"The Role Of Effective Information Dissemination In Mitigating The Effects Of Fuel Subsidy Removal In Nigeria, With A Focus On Kogi State".***

After the removal of fuel subsidy, there have been series of misinformation from different quarters and such rumour mongering can result to fake news, chaos and anarchy that will cause setback for Nigeria's democratic journey.

Librarians and other information experts in the media houses need to be more proactive in their responsibilities, by providing timely information to Nigerians, because government and governance is a social contract between the leaders and the followers. Through effective information dissemination, Nigerians will be in

a better position to really understand government policies and how to cooperate with the government for the achievement of the goals of the policy of fuel subsidy removal.

Kumar (2017) observed that, the vital activities in the library involves acquisition, collection, processing of information – materials to render information services like Reference services, document delivery, selective dissemination of information etc., all these acts to satisfy the information needs of the readers about full subsidy removal.

Oghenetega (2014) is of the opinion that we are now in the era of Information and Communications Technology (I. C. T.), the use of ICT in the library is becoming more popular especially in academic Libraries in Nigeria. The use of ICT involves online literature searching, and making use of computers to support learning and research (McDonald 2005). With the aid of ICT, Librarians and other library staff stand a better position to disseminate current and relevant information available to information seekers at free cost.

According to Khan (2016) in the olden days, the library was considered as a mere house of knowledge, where some people cannot even differentiate between a library and a bookshop, but with the advent of Information and Communication Technology (ICT) libraries are better positioned to render effective information services to library users and information seekers. The emergence of ICT in the field of Library and Information Science brought about changes in the way Libraries operate, which enables new forms of Library and Information Services as well as adding value to existing processes and activities, facilitating the service of librarians' interaction with users.

Sutton (2001) observed that the changes brought about by ICT into the Library and Information Services (LIS) profession can be divided into major categories; namely the natural evolutionary change, and on the other hand transformational changes.

Sutton (2001) further added that, with the evolution of information service delivery today, library and information professionals have harnessed the potential of ICT to perform old tasks better and more efficiently, through the digital nature of housekeeping tasks such as reference works, bibliographic services, cataloguing serial control, circulation and acquisition. In this regard, the transformational changes which have occurred include the emergence of new functions arising out of an expanded demand-driven information society, wider interdisciplinary jurisdiction of information services with closer focus on ever-expanding techno-centric user's needs. These informative trends represent systematic changes that substantially alter the boundaries of the Library and Information Sciences (LIS) profession. It has also been noted by Kumar

(2015) that, library now witness the genre of library users who exhibit much dexterity in the use of modern information technologies such as the social media and other collaborative technologies. This generation of information seekers have greater preference for information resources in electronic format, which are available on the internet. The resources can be easily accessed through computers, laptops and mobile devices. As a result, librarians in Kogi State need to take advantage of the new trends in information technology to disseminate needed information to information-seekers as a means of reducing misinformation and fake news that can destabilize peace in our society, the era of post-fuel subsidy removal.

STATEMENT OF PROBLEM

One of the greatest problems that is of concern to the researcher is the evil of fake news and misinformation. If Nigerians are not properly informed about the issues surrounding fuel subsidy removal, it could lead to violence, destruction to lives and property.

Again, Nigeria is one of the largest Countries on the African continents which also occupies a very important position in African politics; that is why there is that belief that, Nigerian is a “big brother” to other smaller African nations. In view of the above, any government policy that could cause social unrest has to be properly managed through information dissemination. As it has been stated before that government and governance is a social contract between the leaders and the followers, there is need for effective dissemination of information about the plan of government to alleviate the suffering of the people as a result of the removal of fuel subsidy. Due to the large population of Nigeria, which was estimated to be over two hundred million people, the problem is that if there is war in Nigeria over the issue of removal of fuel subsidy, which Country in Africa has such capacity to accommodate refugees from Nigeria? That is a serious problem that the policy-makers should seriously think about, so that Nigerians should be well-informed about the pains and the future gains of removal of fuel subsidy.

It is in view of the above, that researches of this nature should be intensified to proffer solutions to some of the salient issues that could throw the Country into a state of confusion.

JUSTIFICATION OF THE STUDY

This research work is very important to different people and most importantly the general public, because the research work is a good material to policy-makers. In policy circles; like policy formulation, policy implementation, policy analysis and evaluation, the policy makers need to relate the policy of fuel subsidy removal with all these processes, to ascertain if the government has actually taken enough time, in the formulation of this policy, and if the National Assembly has really well in the evaluation

processes, and the effective implementation of the policy. All these processes associated with public policy need to be properly adhered to for the policy of the government to achieve the desired objectives.

Another importance of this research work is that, it deals with contemporary issue that affects Nigerians both poor and rich. All of us in Nigeria cannot do without fuel, the business class, politicians, students, lecturers, doctors all need petrol to survive, because petrol is the mainstay of the Nigerian economy. That is why the Labour Party (LP) has condemned the action of government in removal of fuel subsidy, that the policy was forced on Nigerians without due consultation (Bakare, 2025).

This research work can also serve as reference material to future researchers who may likely have related research work to carry out. The research recommendations at the end of this research work would go a long way to ameliorate some of the challenges associated with the policy of fuel subsidy removal in Nigeria.

Ozili (2023) opined that fuel subsidy removal in Nigeria has been a contentious economic reform, often accompanied by social unrest, inflation and political backlash. Fuel subsidies have long been a financial burden on the Nigerian government, often criticized for being economically unsustainable and disproportionately benefitting the wealthy (Nwokolo, 2022). Their removal, though fiscally prudent, usually results in socio-economic disruption.

Historically, fuel subsidies were introduced to cushion Nigerians against global price volatility. However, they became a drain on the economy, costing the government billions annually (NESG, 2023). The removal of subsidies particularly under the Tinubu administration in 2023 sparked protests and public outcry, underscoring the need for better communication strategies.

RESEARCH OBJECTIVE

Given the nature of the problem under study, "The Role of Effective Information Dissemination in Mitigating the Effect of Fuel Subsidy Removal in Nigeria, A Case Study of Kogi State", the main objective of this research work is to contribute to the development of the nation through a research work geared towards solving contemporary issues affecting the nation. Other objectives of the study are:

a) To embrace fuel subsidy removal policy as a policy in the right direction.

b) To promote effective information dissemination strategies that, can fully inform Nigerians about this policy.

c) To reduce the tendency of rumour mongering as a result of misinformation arising from the policy of fuel subsidy removal.

d) To highlight some palliative measures put in place by Kogi State government to reduce the effects of suffering of the people.

RESEARCH QUESTION

To achieve the purpose of carrying out this research work, these research questions emanated from the objectives as follows:

1) Is the removal of fuel subsidy a policy in the right direction?
2) Is the Nigerian populace well-informed about the pains and gains of this policy?
3) Can misinformation about the policy of fuel subsidy removal cause social unrest, chaos and anarchy?
4) Is it necessary for the government to roll out some palliative measures to cushion the effects of this policy?
5) Can effective information dissemination help Kogi people to really cooperate with the government?

SCOPE OF THE STUDY

This aspect of the research explains the coverage of the research work. The research is basically on "The Role of Effective Information Dissemination in Mitigating the Effects of Fuel Subsidy Removal in Nigeria with A Focus on Kogi State Government". The research work covers six months from June-December, 2025. Within the time of the study, the researcher intends to collect data from the respondents and all those relevant stakeholders in the State, to get adequate information on the subject matter of the research work.

CLARIFICATION OF CONCEPT

Fuel Subsidy Removal

Fuel subsidy is the amount the government has been paying to augment the amount consumers are paying for fuel.

Effective Information Dissemination

In the contest of this write up, effective information dissemination connotes the free flow of information from government, the media and other relevant stake holders in the implementation of fuel subsidy removal policy to the people so that Kogi people will not be misinformed about t the policy.

To Ebijuwa (2005) information dissemination as the processes and techniques of sharing and sending information to the target audience. Raganathan Library Rule (3) states that "Every Book. Its Reader and every person, his or her own book". This golden rules from Raganathan illustrated the fact that, library is meant to provide information to information users.

Oni (2002) believed that, the world, especially developing nations believed that information is power, because we are in the era of information revolution. This is the period Nigeria and other

developing economies have accepted information as valuable resources equitable to natural resources like gold, petrol, coffee etc. Information dissemination techniques are all the means of making information more accessible to the information seekers, such information can only make the needed impact in the life of the people when it is effectively disseminated.

LITERATURE REVIEW

FUEL SUBSIDY REMOVAL AS A GOVERNMENT POLICY

According to Johnson (2023) in a report by Price Waterhouse Cooper (PWC) in Nigeria titled "Fuel Subsidy in Nigeria, Issue Challenges and the Way Forward", the price of petrol was increased by subsidy removal policy of President Asiwaju Bola Tinubu immediately the President was sworn in as the 16th President of Federal Republic of Nigeria on May 29th, 2023.

The announcement of this policy was described by Johnson (2023) as "sudden and unexpected" as it was done without the President discussion with the relevant stakeholders. To him, the policy was not new, because President Goodluck Jonathan attempted to remove fuel subsidy but sparked a lot of criticism.

Muyideen (2023) reported that, President Ahmed Bola Tinubu declared that "fuel subsidy is gone". He said, in the President's inaugural speech, the President commended the decision of former President Muhammadu Buhari to phase out petrol subsidy regime which he said, had increasingly favoured the rich over the poor.

Tinubu said the subsidy can no longer justify its ever-increasing costs in the wake of drying resources. The President opined that "we shall re-channel the fund to better investment in the public infrastructures, education, healthcare and job creation that will improve the lives of millions of Nigerians".

On fuel subsidy removal, Abass (2023) observed that "there will be more revenue for the government an unlocking of about 7 trillion Naira into the Federation Account while reducing the fiscal deficit". The subsidy removal will also eliminate economic distortions and stimulate investment. We would see more private investments in private refineries, petrochemicals and fertilizer plants.

To Idowu (2023) the post-subsidy regime would also unlock investments in pipelines, storage facilities, transportation and retail outlets. He further opined that, "smuggling of petroleum product across the borders will come to an end with the market pricing of refined products. It is important to put an end to NNPC monopoly in the supply of petroleum products. Competition is imperative for subsidy removal to be sustainable".

In line with fuel subsidy removal issue, Idowu (2023) further stated that, the leadership of Petroleum and Natural Gas Workers

(NUPENG), urged President Tinubu to implement the Petroleum Industry Act (PIA) signed by his predecessor into law to achieve the objective of having a petroleum industry that will be accountable, rewarding and transparent in financials, governance and responsiveness to the needs and the yearnings of communities and stakeholders.

Abubakar (2023) opined that the policy of fuel subsidy removal was a good one, but since this policy is going to affect Nigerians, the National Assembly and the House of Representatives should have discussed this policy before the implementation. One thing is to formulate a policy another thing is for that policy to solve societal problems.

Dr. Abubakar Umaru Kari, an Associate Professor of Political Sociology, University of Abuja said the speech of President Tinubu shows rare intent and resolve to take tough decision on fuel subsidy as well as unity and inviolability of the sovereignty of Nigeria. He further added that, "for me it was a good speech: lucid, loaded and replete with key pronouncements, including a few strong policy ramifications but which could also shock and awe".

Johnson (2023) further discovered that, since the discovery of crude oil in Oloibiri, Bayelsa State in 1956, petrol has remained the mainstay of our economy. Any increase in the price of petrol has tremendous impact on all the sectors of the Nigerian economy. To him diversification of Nigeria's economy from fuel (petrol) to other sectors, like investing more in agriculture, solid mineral, tourism will increase the rate of economic development, as the removal of fuel subsidy may result to increase in poverty and economic hardship.

According to Audu and Ehoniyotan (2011) "information is power". It means that, this era of post-fuel subsidy removal, Nigerians, especially Kogi citizens need more information about fuel subsidy removal. Citizens need to be adequately informed about policy that affects their lives directly. The unstable electricity supply has been a serious problem in Nigeria which has been affecting the industrial sector, that most companies now use petrol and diesel engines to power the companies. Removal of fuel subsidy coupled with epileptic power supply can worsen energy crisis in Nigeria.

The Role of Effective Information Dissemination In Mitigating The Effects Of Fuel Subsidy Removal In Nigeria

Effective dissemination of information is defined here as the strategic, transparent, and inclusive communication of government policy and how it can significantly mitigate these negative impacts. These roles are stated as follows:

1. Public Awareness and Education

   Public Awareness campaigns that explain economic benefits, address misconceptions, and clarify the governments intentions can reduce resistance (Punch, 2023).

2. Stakeholder Engagement

   Engaging civil society organizations, labour unions, and local leaders allows the government to tailor messages and incorporate feedback (Guardian, 2023).

3. Media Strategy

   The media plays a central role in shaping public opinion. Messages must be delivered in local languages and cultural contexts (Academia et at, 2023).

4. Transparency and Trust Building

   Providing data on how subsidy savings are reinvested builds public trust. The people would like to know how and what the money saved from subsidy removal is utilized, so as to build trust in the government (Premium Times, 2024).

5. Combating Misinformation

   A responsive and accurate communication system counters false narratives effectively. There should be a regular, prompt and free flow of information and communication from the government (Academia edu, 2023).

6. Complementary Communication with Social Policies

   Dissemination must be coupled with information about social safety nets like conditional cash transfers. Awareness of these measures can prevent social unrest and support vulnerable populations (NESG, 2023).

Challenges in Dissemination

Dissemination efforts face challenges such as low public trust in government, digital illiteracy and language diversity. Overcoming these challenges requires institutional capacity building and partnerships (Brand-Crunch, 2020). Effective dissemination of information is not merely a supplementary activity in subsidy reform, it is central to its

success. The Nigerian government must adopt an inclusive, transparent and strategic communication approach to ease the transition from fuel subsidy and achieve long-term development goals.

Mitigating the Effect Of Fuel Subsidy Removal Through Effective Information Dissemination

As observed by Raifu & Afolabi (2024), the following are suggested ways of mitigating the effect of fuel subsidy removal through effective information dissemination:

1. Transparent Communication of Rationale

   Clarify why subsidies were removed, using relatable terms and data. For transparency's sake and avoidance of doubt and suspicion, unnecessary jargons should be avoided and evidence on how savings are reinvested be provided.

2. Multi-Channel Information Campaigns

   Use traditional media (radio, TV), digital platforms (Facebook, WhatsApp), and community for a to ensure inclusive messaging to the entire populace.

3. Highlight Tangible Benefits

   Publicize reinvestments of saved funds in visible projects. Share citizen success stories to build trust and buy-in. People want to know and hear what the saved funds are being used for.

4. Engage Influencers and Local Leaders

   Partner with traditional rulers, religious leaders, and influencers. Train youth leaders and NGOs for grassroots outreach.

5. Establish Feedback and Support Channels

   Create toll-free lines and apps for questions and grievances. Monitor feedback to adapt messaging strategies.

6. Counter Misinformation Rapidly

   Deploy rapid response teams and fact-checking alliances to tackle false narratives and prevent panic or unrest.

7. Long-Term Public Education

   Incorporate economic policy literacy in civic education and mass media programs. Use creative formats like comics or radio plays to provide entertaining and educative programmes.

Policy Formulation and Implementation

Ojuola (2006) opined that, when we talk of policy process, it means the various ways in which public policy are formulated. The subject matter of public policy varies, as such, approaches to their formulation differs. To this author, it does not matter which institution is responsible for policy formulation and implementation, but the concern is:

i. What is the policy about?

ii. For what reason?

iii. How was it determined?

iv. What determines the policy options?

v. Who are people involved?

vi. Can the policy succeed in goal attainment? If no, why? If yes, how do we improve the quality of the policy?

It is from the above perspectives that the researcher wishes to evaluate fuel subsidy removal policy. Any public policy can be made in any political system. That is that government has the right to formulate public policy into any political system, be it democracy, dictatorship, autocracy, military, aristocracy or any other system at all (Ayinde, 2006).

To Mahajan (2019) policy is viewed as the action of the government and public policy can be broken into categories of sequential pattern, the process are:

PROBLEM SELECTION – We can ask questions: What are the issues? How does it get into the agenda of the government? They are those problems among many which receive the serious attention of the officials. They are those problems which are made to know to the government for consideration.

Efficacy of Effective Policy Implementation

Ayinde (2006) added that, the importance and the significance of any policy can be determined by policy implementation. The policy implementation stage is also very important, because it is the stage where the actions of the government manifest in form of infrastructural project, rules, laws, regulation etc. To really understand policy implementation, these important questions should be asked:

i. Who is involved?

ii. How do we apply the policy to solve societal problems or the particular problem?

iii. Does the people involved have the qualification and capacity to do a good job?

He further added that, before now, scholars of public policy are of the opinion that once a good policy is formulated, its implementation could not be problematic. It has now been discovered that the major problem confronting public policy is implementation.

In line with the above, the researchers observed that, the removal of fuel subsidy has increased the level of poverty, increase in the cost of living, making life really unbearable to an average Nigerian. In any country why poverty is on the increase, there would be challenges of underdevelopment, insecurity and low level of life expectancy.

Concept of Information Dissemination

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Oni (2002) believed that, the world, especially developing nations believed that information is power, because we are in the era of information revolution. This is the period Nigeria and other developing economies have accepted information as valuable resources equitable to natural resources like gold, petrol, coffee etc. Information dissemination techniques are all the means of making information more accessible to the information seekers, such information can only make the needed impact in the life of the people when it is effectively disseminated.

In view of the above, Kogi citizens need adequate information to really appreciate the efforts of the present government at State and National levels, in their efforts to provide the necessary palliatives that can cushion the effects of the hardship created by the policy of fuel subsidy removal. Fagbola (2011) opined that, libraries, especially academic libraries, have very important roles to play in dissemination of most recent information to the people through its current awareness services and strategies; so that Nigerians can be well informed about the intentions of government on the policy of fuel subsidy removal. This is very important in the sense that, Nigeria is one of the largest countries on the African Continent that occupies a very important position in African politics. There is that belief that Nigeria is a "big brother" to other smaller African countries, and if there is economic crises in Nigeria as a result of the removal of fuel subsidy, which country in Africa has the capacity to absorb Nigerian refugees? The population of Nigeria has been estimated to be above two hundred million people, which shows that no African country can cope with refugees from the large population. Researchers, policy-makers, librarians, information experts and other meaningful Nigerians should then provide adequate information that can move this country forward in this era of post-fuel subsidy removal.

Theoretical Framework

This study is based on Competitive Economic Theory Model. This model promotes sustained rate of productivity which is able to drive economic growth and consequently increase income and welfare at long run. Before the implementation of fuel subsidy removal policy, government believed that payment of subsidy has become an economic burden on government for over a long period of time and subsidy has it were has no really benefited the common man but the few privileged Nigerian.

It is based on these premises that the president decided to call a spade a spade, by putting an end to fuel subsidy and also allow the private sector to do the fuel business while government provides the regulatory framework.

Methodology of The Study

This involves the procedures for analyzing the raw data obtained through field survey. The procedure used in analyzing of the data involves the use of tables, frequencies, percentages, ranking which would be done statistically.

Agba and Adamu (2015) stated that the objectives of the research work cannot be achieved without the analysis of research data.

Primary Method

This involves the collection of data from the main sources through use of research tools like questionnaires, observation techniques and personal interaction with the respondents.

Secondary Method

This also involves the use of documented sources of information, and other secondary data relevant to the write up

DATA ANALYSIS

This involves the procedures for analyzing the raw data obtained through field survey. The procedure used in analyzing of the data involves the use of tables, frequencies, percentages, ranking which would be done statistically.

Agba and Adamu (2015) stated that the objectives of the research work cannot be achieved without the analysis of research data.

Discussion of Findings

From the analysis of data obtained from the research questionnaires, the researchers discovered some findings.

It was discovered from even the comments made by respondents and some articles published on the pages of newspapers in Nigeria, that fuel subsidy removal was actually a policy in the right direction, because of the economic wastage associated with the politics of fuel subsidy. It was also discovered that, the policy has great implications on the socio-economic wellbeing of Nigeria, especially in Kogi State.

Most of the respondents agreed that the news about fuel subsidy removal was sudden alarming and unexpected, because Nigerians are already in hardship from and waiting for President Tinubu to ease the suffering but the reverse was the case.

The researchers also discovered that, the news about fuel subsidy removal spread to all States of the Federation, through radio, television, social media etc., which shows that most Nigerians received the news with shock, immediately after the inaugural speech of Mr. President on May 29, 2023.

Contribution To Knowledge

This study adds value to existing knowledge and researches on this subject matter. Apart from the immense contribution of the study to knowledge advancement, the study is also tailored towards addressing contemporary socio-economic challenges faced by Kogi people as a result of fuel subsidy removal.

The pains and the hardship of fuel subsidy removal is not just a challenge but an issue of national interest that deserve more researches to proffer solution to this national problem.

Conclusion

In conclusion, an important policy of fuel subsidy removal, should have been adequately discussed by the States, National Assembly and other relevant stakeholders, to look at the challenges, advantages and the way forward, but since this was not done by the government before the announcement of the policy, the best way to ameliorate the implications on the citizens, is to carry the people along through effective information dissemination strategy to assure the people that government palliative measures to cushion the effects of this present hardship created by implementation of government policy.

In this present democratic dispensation, people should be well informed about how the policy of government promotes good governance. As long as the researchers have stated it in the Literature Review that government is a social contract between the leaders and the subjects, so efforts should be intensified so the citizens know the future benefits of fuel subsidy removal, in the areas of education, health, security, infrastructural development etc.

Recommendations

As we all know that the removal of fuel subsidy is a policy that has created some socio-economic challenges that Nigerians need to cope with, it is a contemporary challenge that demands solutions. As part of the contribution of the researchers in providing the way forward, these recommendations are put forward:

1. Government should be more transparent in the area of adequate information dissemination, as a means of letting people know the strategies of government in easing the pains of fuel subsidy removal.
2. As a matter of policy there should be prudent accounting systems in the management of the revenue generated from the policy, such accounts should be known so that stakeholders can really know that, there would be gains after all the economic hardship.
3. Palliative measures should be put in place in all States and Local Government Areas to reduce the suffering of the people.

4. Such palliative measures should not be meant for civil servants alone, or the politicians, but for the common people, especially the vulnerable groups.
5. Government at all levels should enhance maximum productivity in agriculture to ensure food security, as the removal of fuel subsidy has taken food out of the reach of the poor.
6. Citizens should also understand the fact that they need to cut down their luxuries, to cope with the present economic hardship occasioned by the removal of fuel subsidy.
7. The citizens need adequate security, through the proceeds of fuel subsidy removal, efforts should be made to improve the security of the citizens, and reduce the present rate of armed robbery, kidnapping etc.
8. Since the price of fuel is on the high side, there is need to reduce power failure so that industries depending on fuel can fall back to electrical energy.
9. As a means of carrying citizens along, more programmes and discussions should be on our radio and television stations to update citizens about the way forward.
10. In this post-fuel subsidy removal era, more roads should be prepared, more infrastructure provided as a means of raising the standard of living of Nigerians.
11. More educational facilities should be provided at all levels from the proceeds of fuel subsidy removal.
12. Health is wealth! Efforts should be intensified by the health sector to improve healthcare delivery services, to reduce self-medication killing Nigerians as a result of their inability to pay for hospital bills and medication.
13. Because the policy of fuel subsidy removal affects almost all the citizens; the researchers also recommend further research in this direction.

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Metal Contamination and Health Risks In Raw Milk From Lokoja Metropolis, Kogi State, Nigeria.

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Abstract

The pressures of population growth, urbanization, and industrialization have intensified environmental pollution, with heavy metals emerging as major foodborne contaminants of public health concern. This study investigated the concentration of copper (Cu), iron (Fe), lead (Pb), cadmium (Cd), chromium (Cr), and zinc (Zn) in raw cow milk obtained from dairy Fulani hawkers in Felele, Lokoja, and surrounding areas of Kogi State, Nigeria. A total of 50 samples were collected between March and August 2024, digested using the standard wet acid digestion method, and analyzed by Atomic Absorption Spectrophotometry (AAS). The results showed that Pb concentrations (0.043–0.411 $mg \cdot L^{-1}$) exceeded the Codex/FAO-WHO permissible limit of 0.02 $mg \cdot L^{-1}$ across all sampling locations, indicating significant health risks. Cd levels (0.011–0.053 $mg \cdot L^{-1}$) were similarly high, especially in Igbonla, while Fe concentrations (1.01–2.10 $mg \cdot L^{-1}$) were above expected background values, suggesting contamination from feed, water, or metallic equipment. Cr levels were generally low but reached 0.177 $mg \cdot L^{-1}$ at the Felele bus stop, likely reflecting anthropogenic activities such as traffic and mechanical workshops. By contrast, Cu (0.015–0.115 $mg \cdot L^{-1}$) and Zn (0.201–0.821 $mg \cdot L^{-1}$) were within acceptable ranges and posed no immediate regulatory concern. Health risk assessment revealed that the Target Hazard Quotient (THQ) for Pb and Cd approached or exceeded safe thresholds, suggesting potential non-carcinogenic risks, particularly for children and other vulnerable populations. The findings identify Pb and Cd as the primary contaminants of concern in raw milk from the study area. Continuous monitoring, source-control strategies, and stricter regulatory enforcement are strongly recommended to safeguard public health.

Keywords: Heavy metals, Milk contamination, Public health, Lead, Cadmium.

1.0 Introduction:

With the rise in population, industrialization, and urbanization, numerous pollutants have been released into the environment. Among them, heavy metals such as chromium (Cr), copper (Cu), cadmium (Cd), iron (Fe), Zinc (Zn) and lead (Pb) have become widely dispersed, increasing their likelihood of entering the human food chain (Kwon et al., 2017; González-Montaña et al., 2012). These heavy metals pose significant health risks to both livestock (Rahimi, 2013; Norouzirad et al., 2018) and humans (Perween, 2015), as they are highly toxic even at low concentrations, leading to hematologic, neurotoxic, and nephrotoxic effects. Certain organs are negatively impacted by human exposure to these metals, which can also cause cancer, heart failure, exhaustion, and metabolic problems (Norouzirad et al., 2018; EFSA, 2010; Panel & Chain, 2009; EFSA, 2012). Due to their developing immune systems and different gastrointestinal absorption processes from adults, children are especially affected by this problem (Su et al., 2020). Hexavalent chromium (Cr VI), arsenic (As), and cadmium (Cd) are all categorized as Group 1 carcinogens by the International Agency for Research on Cancer (WHO/IARC, 2020), whereas inorganic lead (Pb) is categorized as Group 2A. According to their prevalence, toxicity, and potential for human exposure, arsenic, lead, cadmium, and chromium were classified as the most dangerous food contaminants in the United States by the Agency for Toxic Substances and Disease Registry (ATSDR, 2019).

Milk, a natural product secreted by the mammary glands of mammals, is widely consumed to meet human nutritional requirements. Owing to its rich composition, it serves as an essential source of nourishment that supports health, cognitive development, and overall growth, particularly in children (Krismaningrum & Rahmadhia, 2020).For instance, fresh cow milk is a kind of milk that is often consumed by the public. This is because besides being easy to obtain and having high nutritional content, fresh cow's milk is also relatively affordable. In a study conducted by Umar et al. (2021), cow milk was reported to be a rich source of protein, fat, carbohydrates, minerals, and vitamins. The overall quality of food and food ingredients in nature cannot be separated from various influences, such as environmental conditions which are the benchmark needed for food to obtain eligibility for consumption (Rahma et al., 2021). The ultimate quality of milk will decrease if there are contaminants in it. Raw milk can be contaminated with heavy metals from the environment, such as Cr, As, Hg, Pb, and Cd. Milk contamination can be caused by several things, such as microbes, pesticide residues, and heavy metals accumulation. Research by Pilarczyk et al. (2023) reported

that consuming meat and milk from heavy metal-contaminated environments is very dangerous for the consumers. Heavy metal contamination of the animal can occur due to organic rearing because heavy metals can come from feed or drinking water that contains a lot of heavy metals. One of the animal-based food ingredients that contain a good nutritional value for human consumption is milk (Arini & Ifalahma, 2021). Mammalian milk has quite a potential opportunity in product development. Milk is popular with the wider community because of its beneficial nutritional content. Fresh raw milk is a liquid produced from the udders of healthy and clean animals from proper milking; its natural content is still pure without being reduced or adulterated with anything. Foodstuffs must be free from the possibility of biological, chemical, and other contamination that can interfere with, harm, and threaten human health, and do not conflict with religion, beliefs, or community customs, so they are suitable and safe for consumption (Hartajanie et al., 2022).

Heavy metals are often described as metallic and metalloid chemical components with high atomic weights and specific gravity, which can be toxic to living things. Heavy metals such as cadmium (Cd), mercury (Hg) and lead (Pb) are not essential elements and have no biological role, but at very low concentrations they can cause toxic effects (Varol & Sünbül, 2020). Heavy metals can enter foods such as milk and processed products and bioaccumulate in vital organs causing disturbances in kidney function, anemia, the reproductive system, and the nervous system (Silalahi & Purwanti, 2021; Rislamia, 2022). Immense environmental pollution has elevated the problems of milk contamination and uncertainties about milk qualities (Farid & Baloch, 2022). The worldwide milk contamination through environmental pollutants and xenobiotic compounds via cattle feeds like toxic metals, mycotoxin, dioxin and other pollutants are considered to have tremendous influence on public health (Seyed & Ebrahim, 2022). Intake of these contaminated milk acts like an additional source of heavy metal exposure (Ruqia et al., 2020). The main sources of metal contamination are industrial or domestic effluents, combustion, bushfires, decomposition of chemical fertilizers, pesticides, etc. (Degnon et al., 2022). Overexposure of humans to heavy metals could lead to abdominal pain, hepatotoxicity, neurotoxicity, vomiting (Hussain et al., 2020), decreased intelligence quotient (IQ) level, Alzheimer's disease, behavioral disorders (Ahmad et al., 2021), tissue injury, irritation of lungs, cancer (Bushra et al., 2024), etc. Furthermore, heavy metals are known to be highly resistant to bacteria and environmental degradation in nature and become accumulated in the food chains via

biotransformation, bioaccumulation, and biomagnification (Aslam et al., 2021). Complete elimination or prevention of chemical contaminants cannot be achieved from raw milk because the lipophilic contaminants will always find their way into the persistent fat compounds from where heavy metals cannot be readily removed (Girma et al., 2024). The contamination of foodstuffs due to metals and other environmental pollutants is one of the most important issues in developing countries. Several studies have been conducted around the world with reference to the health risks of metals in environmental matrices, for example, arsenic in cultivated rice in Sri Lanka (Channa et al., 2020), trace metal and aflatoxin in cassava flour in West Africa (Hayford et al., 2021), metals-contaminated mushrooms in Ethiopia (Medhanye et al., 2022), health risks for contamination of foods and soils in China (Khan et al., 2023), and India (Sridhara et al., 2023). However, it was observed that continuous long-term exposures of consumers to heavy metals through the consumption of raw milk get less emphasis in developing countries, particularly in Nigeria. Considering the aforementioned challenges in terms of public health hazard of Nigerians, this study was carried out to investigate the concentration of selected heavy metals contaminating raw milks in Felele and Crusher areas, Lokoja, Kogi State. The results from this study are expected to provide baseline information on the level of pollution in this catchment.

2.0 Materials and methods

2.1 Collection of Samples

A total of 50 samples of raw milk of cow were collected from March 2024 to August 2024 from various dairy Fulani hawkers in Felele, Lokoja and environs, Kogi State, Nigeria. All samples were collected in nitric acid-washed polyethylene containers. The samples were immediately transported to the laboratory in a cooler with crushed ice packs and were stored in deep freezers at −20 °C prior to analysis.

2.2 Sample Preparation

All the laboratory glassware and working surfaces were washed well with deionized water and diluted HNO_3 (10%), then rinsed with deionized water followed by drying. The digestion vessels were soaked in water and detergent for about 3 hours with subsequent several rinsing with distilled water and then with a mixture of 80 ml H_2O_2, 200 ml HCl (37%), and 250 ml of deionized water, and again one more time with 10% diluted HNO_3. Finally, all the equipment were washed at least three times using deionized water and air-dried (Sallam et al., 2019)

2.3 Samples Digestion

The samples were digested by the wet acid

digestion technique according to the method reported by Sallam et al. (2019). Two ml of the raw milk samples were homogenized well and transferred quantitatively to a 20-ml screw-capped tube containing 10 ml HNO_3 (97%) and 30 ml HCl and heated at 53 °C in a water bath until complete digestion, followed by cooling at room temperature. After cooling, the digested mixture was placed in a 50 ml volumetric flask containing distilled water to be diluted and then filtrated using Whatman filter paper (No. 42, Merck, Darmstadt, Germany) into clean Pyrex glass tubes and kept at room temperature (35 °C) until analysis for their metals content (Hg, As, Pb, Cd, Cr and Cu) (Sallam et al., 2019). Standard or blank solutions were also prepared in the same manner as the wet digestion technique but without adding any sample. The blank solutions were analyzed to determine any contamination of the chemicals with heavy metals and to be subtracted from the final results.

2.4 Heavy Metals Analysis

Collected filtrates were analyzed for their mercury, arsenic, lead, cadmium, chromium, and copper at the Central Laboratory, School of applied Sciences, Kogi state polytechnic Lokoja,. Heavy metals analysis was carried out with the use of an Atomic Absorption Spectrophotometer (AAS; Buck scientific 210 VGP, Inc.), Iron, Lead, Cadmium, Copper, and Chromium were determined by air acetylene flow flame AAS (Sallam et al., 2019).

2.5 Health Risk Assessment

The EDI and THQ of heavy metals were calculated to appreciate the non-carcinogenic risks associated with the consumption of heavy metals in dairies. The EDI was calculated according to Eq. (2).

$$EDI = \frac{C \times D \text{ mg/kg bw / day}}{BW}$$

Where, C = the mean concentration of heavy metals in raw milk samples (mg/kg),

D= dairy intake is the daily consumption of milk for each kg BW of an adult person,

While BW = average body weight for an adult person = 70 kg. The average daily consumption per adult person was recorded to be 58.97 mL/g of milk (FAO. 2023).

The THQ was affirmed by the Environmental Protection Agency (EPA) in the USA to determine the non-carcinogenic health risks linked to the consumption of heavy metal-contaminated food, frequency and duration of metal, body weight, and other parameters (USEPA. 2019).

The THQ was calculated according to Eq. (3).

$$THQ = \frac{EDI}{RfD} \quad (3)$$

where, RfD is the reference doses (mg/kg/day) = 0.0001, 0.001, 1.5, 0.04 (mg/kg/day) for Hg (MeHg), Cd, Cr, and Cu, respectively (USEPA. 2019). If the results

of THQ are more than 1, it indicates that the risks of non-carcinogenic potential hazards for human health may occur, but if THQ is less than 1, there won't be any health risk. Yet, if the individual THQ is less than 1, the non-carcinogenic adverse hazards might happen due to the cumulative effect of such heavy elements.

3.0 Results:

3.1 Average Concentration of Heavy Metals in Cow Milk (Raw) Sample (mg/l)

Table 1 Average Concentration of Heavy Metals in Cow Milk (Raw) Sample (mg/l)

Sampling Point	Copper	Iron	Pb	Cd	Cr	Zinc
Crusher	0.0584±0.00	2.10±0.07	0.043±0.04	0.013±0.033	0.0045±0.10	0.606±0.064
Bassa Village	0.1147±0.035	1.01±0.001	0.134±0.41	0.011±0.19	0.0111±0.19	0.201±0.003
Igbonla	0.0154±0.001	1.44±0.023	0.071±0.06	0.053±0.00	0.0211±0.021	0.312±0.091
Felele bus stop	0.021±0.021	1.992±0.11	0.411±0.20	0.021±0.91	0.177±0.061	0.821±0.001
WHO Limit (mg/l)	1.0000	0.0300	0.0100			5.0000

3.2 Estimated Daily Intakes (EDI) of the heavy metals detected in dairy products samples (mg/kg bw/day)

Table 2 Estimated Daily Intakes (EDI) of the heavy metals detected in dairy products samples (mg/kg bw/day)

Sampling Point	**EDI Cu**	**EDI Fe**	**EDI Pb**	**EDI Cd**	**EDI Cr**	**EDI Zn**	**THQ Cu**	**THQ Fe**	**THQ Pb**	**THQ Cd**	**THQ Cr**	**THQ Zn**
Crusher	0.000049	0.001769	0.000036	0.000011	0.000004	0.000511	0.00123	0.00253	0.01035	0.01095	0.00126	0.00170
Bassa Village	0.000097	0.000851	0.000113	0.000009	0.000009	0.000169	0.00242	0.00122	0.03225	0.00927	0.00312	0.00056
Igbonla	0.000013	0.001213	0.000060	0.000045	0.000018	0.000263	0.00032	0.00173	0.01709	0.04465	0.00593	0.00088
Felele bus stop	0.000018	0.001678	0.000346	0.000018	0.000149	0.000692	0.00044	0.00240	0.09893	0.01769	0.04970	0.00231

4.0 Discussion

The concentrations of heavy metals in raw milk samples from Felele Metropolis demonstrated significant spatial variation with important public health implications (Table 1). Lead (Pb) levels (0.043–0.411 $mg \cdot L^{-1}$) were consistently above the Codex/FAO-WHO maximum residue limit of 0.02 $mg \cdot kg^{-1}$ (≈0.02 $mg \cdot L^{-1}$ for liquid milk), indicating a clear exceedance of international safety standards. This finding highlights Pb as a major contaminant of concern in the study area and corroborates earlier reports that emphasize Pb contamination as a persistent issue in milk safety assessments (Boudebbouz et al., 2023).

Cadmium (Cd) concentrations (0.011–0.053 $mg \cdot L^{-1}$) were also elevated when compared to values reported in several national and international studies. The highest Cd level, observed in Igbonla (0.053 $mg \cdot L^{-1}$), is of particular concern since Cd is a bioaccumulative contaminant known to persist in dairy products (Boudebbouz et al., 2021). Iron (Fe) levels (1.01–2.10 $mg \cdot L^{-1}$) exceeded background concentrations typically reported for fresh milk, suggesting contamination from external sources such as animal feed, drinking water, or metallic equipment used during milking and storage (Scutarașu & Trincă, 2023). Chromium (Cr) was generally low across sites but markedly elevated at Felele bus stop (0.177 $mg \cdot L^{-1}$), reflecting likely contributions from traffic-related emissions, roadside workshops, and informal industrial activities (Hasanvand et al., 2024). In contrast, copper (Cu: 0.015–0.115 $mg \cdot L^{-1}$) and zinc (Zn: 0.201–0.821 $mg \cdot L^{-1}$) fell within acceptable ranges commonly reported in Nigeria and globally, posing no immediate regulatory concerns (Oladeji et al., 2024).

Comparison with other Nigerian studies confirms the persistence of Pb and Cd as dominant contaminants. Investigations in Maiduguri, Ogbomoso, and Kaduna similarly reported Pb and Cd concentrations above permissible limits (Garba et al., 2018). Globally, systematic reviews have documented a recurring pattern of elevated Pb and Cd coupled with comparatively stable Cu and Zn, with contamination often linked to polluted pastures, industrial emissions, and contaminated water sources (Chirinos-Peinado & Castro-Bedriñana, 2020).

Spatial variation observed in this study suggests site-specific drivers of contamination. Elevated Pb and Cr at Felele bus stop may be associated with heavy traffic density and mechanical workshops, while higher Cd levels at Igbonla likely stem from contaminated fodder, soil, or agrochemical residues (Chirinos-Peinado & Castro-Bedriñana, 2020).

From a health perspective, Pb levels are particularly concerning, as Pb is a potent

neurotoxin with no safe threshold, especially for infants and young children. Cd exposure, even at relatively low levels, is linked to renal dysfunction and skeletal damage, underscoring the risks posed by the concentrations detected in this study (Boudebbouz et al., 2023). While regulatory frameworks provide a Codex maximum residue limit for Pb, explicit international standards for Cd, Zn, Cu, Fe, and Cr remain inconsistent, making Pb the most reliable regulatory benchmark (Fereja, Muda, & Labena, 2024).

Risk assessment parameters further reinforce these concerns. The Estimated Daily Intake (EDI) values for Cu, Fe, Cr, and Zn were within acceptable dietary limits, indicating no toxicological risk from these essential elements. However, EDI values for Pb and Cd were relatively elevated, particularly at Felele bus stop (Pb: 0.000346 $mg \cdot kg^{-1}$ bw/day) and Igbonla (Cd: 0.000045 $mg \cdot kg^{-1}$ bw/day), suggesting notable contamination. Similarly, the Target Hazard Quotient (THQ) values for Pb (0.09893 at Felele bus stop) and Cd (0.04465 at Igbonla) were the highest among the metals, although still below the threshold of 1. This indicates no immediate non-carcinogenic risks but highlights Pb and Cd as the most significant contributors to potential health hazards from milk consumption. By contrast, Cu, Fe, Cr, and Zn exhibited very low THQ values, reflecting minimal risk. A one-way analysis of variance (ANOVA) was conducted to evaluate differences in the concentrations of copper, iron, lead, cadmium, chromium, and zinc across the four sampling locations (Crusher, Bassa Village, Igbonla, and Felele Bus Stop). The analysis revealed distinct spatial variations in heavy metal levels. Copper concentrations were highest at Bassa Village (0.1147 ± 0.035 mg/kg) and lowest at Igbonla (0.0154 ± 0.001 mg/kg), whereas iron showed its maximum value at Crusher (2.10 ± 0.07 mg/kg) and minimum at Bassa Village (1.01 ± 0.001 mg/kg). Lead was markedly elevated at Felele Bus Stop (0.411 ± 0.20 mg/kg), with chromium also peaking at the same site (0.177 ± 0.061 mg/kg). Zinc exhibited considerable variation, ranging from 0.201 ± 0.003 mg/kg at Bassa Village to 0.821 ± 0.001 mg/kg at Felele Bus Stop. The ANOVA results demonstrated that these variations were statistically significant ($p < 0.05$), confirming that the observed differences were not attributable to random variation but reflect spatial heterogeneity in heavy metal contamination. This indicates that sampling location exerts a significant influence on the distribution of heavy metals within the study area.

5.0 Conclusion and Implications:

This study identified lead (Pb) and cadmium (Cd) as the primary contaminants of concern in raw cow milk from the study area. The

concentrations observed, though variable across sites, consistently exceeded recommended safety thresholds, underscoring a potential public health threat. Continuous exposure to Pb and Cd, even at low levels, is particularly concerning for children, who are more vulnerable due to their lower body weight and higher milk consumption rates. The elevated levels also suggest environmental contamination arising from anthropogenic activities, including vehicular emissions, industrial effluents, and contaminated feed or water sources. These findings are consistent with national and global reports showing that raw milk from urban and peri-urban environments frequently exhibits elevated Pb and Cd, while essential trace elements such as copper (Cu) and zinc (Zn) typically remain within acceptable limits. The exceedances of Pb, Cd, and, in some cases, iron (Fe) emphasize the need for targeted interventions. The elevated concentrations of lead (Pb) detected in raw milk, particularly at Felele Bus Stop, can be attributed to anthropogenic activities such as vehicular emissions, roadside workshops, and informal industrial operations, all of which are recognized contributors to atmospheric Pb contamination. Cadmium (Cd), with the highest levels recorded at Igbonla, is most likely linked to contaminated fodder, agrochemical residues, and polluted soils, consistent with its well-documented bioaccumulative behavior in the food chain. Elevated iron (Fe) levels above typical background concentrations suggest inputs from contaminated feed and water, as well as possible leaching from metallic equipment used during milking, transport, and storage. The pronounced chromium (Cr) concentration at Felele Bus Stop is plausibly associated with traffic emissions, mechanical repair activities, and small-scale industrial processes characteristic of the area. By contrast, the relatively stable concentrations of copper (Cu) and zinc (Zn) across all sites likely reflect their essential roles as dietary micronutrients in livestock, with levels remaining within normal nutritional ranges rather than indicating significant external contamination.

5.1 Recommended strategies include:

1. Identifying contamination pathways, particularly animal feed, water supplies, and equipment used during milking and storage.
2. Conducting detailed human health risk assessments, with a focus on vulnerable populations such as infants and children.
3. Implementing periodic monitoring programs and enforcing stricter source-control measures to minimize contamination.

Several Nigerian and international studies support this integrated approach, which has proven effective in mitigating health risks and

enhancing milk safety. Adoption of such strategies is essential to protect public health and ensure the long-term sustainability of dairy production in the region.

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The Impact of Digital Banking on Nigeria: A Critical Evaluation

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Abstract

Digital banking has transformed Nigeria's financial landscape by providing faster, more convenient and accessible services through channels such as mobile banking, automated Teller Machines (ATMs), Internet platforms, and Point of Sale (POS) terminals. This study critically examines the impact of digital banking on the performance of United Bank for Africa (UBA), with a focus on key financial indicators: Return on Assets (ROA), Return on Equity (ROE), and Earnings per Share (EPS). The source of data is secondary and were systematically extracted, compiled, and organized into e-banking, ROA, ROE and EPS, within the period of year 2018 to 2024. Using correlation and regression analyses, the findings reveal that digital banking has a moderate positive correlation with ROA (0.593) and ROE (0.505), though these relationships are not statistically significant. In contrast, a strong and statistically significant positive correlation exists between digital banking and EPS (0.947, p = 0.001), making EPS the most reliable performance indicator influenced by e-banking. The regression model further confirms EPS as the strongest predictor (B = 0.775, p = 0.004), while ROA and ROE show weak and statistically insignificant effects. Overall, the model demonstrates a strong fit (R = 0.989, R^2 = 0.978, F = 43.966, p = 0.006), suggesting that digital banking significantly enhances bank performance, particularly through shareholder value creation. The study concludes that while e-banking does not significantly improve asset or equity returns, it plays a crucial role in strengthening earnings per share. It recommends that UBA strengthen its digital infrastructure, enhance profitability channels beyond EPS, and continuously monitor the impact of e-banking on financial performance.

Keywords: Digital Banking, Bank Performance, Return on Assets (ROA), Return on Equity (ROE), Earnings per Share (EPS), United Bank for Africa (UBA).

Introduction

The global financial system has experienced profound changes in the last two decades, driven by rapid advances in information and communication technology (ICT). Nigeria, Africa's largest economy, has been no exception, with its banking industry undergoing significant digital transformation. Digital banking encompassing internet banking, mobile apps, Automated Teller Machines (ATMs), and Point of Sale (POS) terminals has become a key driver of financial inclusion and operational efficiency.

The Central Bank of Nigeria (CBN) has spearheaded initiatives such as the cashless policy (2012) and the launch of the eNaira (2021) to modernize the financial sector. These reforms aim to reduce reliance on cash, expand financial access, and integrate Nigeria into the global digital economy. However, challenges remain, including unreliable network infrastructure, limited awareness, and persistent user concerns over fraud, app reliability, and data protection.

This paper critically evaluates the effect of electronic banking on bank performance in Nigeria. It specifically examines the impact of electronic banking on Return On Asset (ROA), Return On Equity (ROE) and Earning Per Share (EPS) respectively using United Bank for Africa (UBA).

Literature Review

Digital banking has played a substantial role in expanding financial inclusion across Sub-Saharan Africa, including Nigeria, yet meaningful uptake remains constrained by shortcomings in digital literacy, trust in digital channels, and last-mile infrastructure. Recent policy and sector analyses emphasize that while digital channels bring many previously excluded citizens into the formal financial system, converting access into regular usage requires stronger consumer protection and focused financial-literacy efforts (Ubah, Adigwe, Okaro, & John, 2023; Central Bank of Nigeria [CBN], 2022; Tsuda, 2024).

Large-scale analyses of mobile-banking user feedback show a mixed picture: average ratings are generally positive, but recurring problems app crashes, difficult authentication flows, intermittent transaction failures and slow or inadequate customer support repeatedly surface in user reviews and sentiment analyses. These reliability and usability problems directly undermine customer trust and slow broader adoption (Omotosho, 2021; Adebiyi, 2022).

The rapid diffusion of information and communication technologies (ICT) has encouraged Nigerian banks to adopt digital channels for both transaction processing and the distribution of financial information. Empirical and review studies find that e-channel deployment (ATMs, internet banking, mobile apps, POS) improves service accessibility and convenience, and is frequently associated with higher customer satisfaction — provided service quality and availability are sustained. However, some studies caution that ICT investments do not automatically translate to improved bank performance unless accompanied by process redesign, staff capability building and reliable network infrastructure (Enang & Uguru, 2024; DLA Piper, 2024).

Nigeria's policymakers have actively promoted digital finance initiatives — including the cashless policy push and the Central Bank Digital Currency (eNaira). The CBN's reports show marked increases in eNaira wallet counts and transaction features after successive product updates, while IMF and other multilateral analyses highlight both the potential of CBDCs to deepen inclusion and the need to manage risks around awareness, interoperability and financial stability (CBN, 2023; International Monetary Fund [IMF], 2023; Tsuda, 2024).

Beyond banks, the expanding fintech ecosystem in Nigeria are driven by high-growth startups and substantial venture financing is accelerating payments adoption and creating alternative on-

ramp channels to the formal system. These fintechs are extending digital payment services into retail, micro-enterprise and last-mile merchant networks, complementing banks' efforts and helping to onboard large numbers of users. Still, policymakers and firms must address the twin tasks of safeguarding consumer trust and ensuring operational resilience as volumes scale (Reuters, 2024; DLA Piper, 2024).

Recent theoretical work provides conceptual frameworks to understand how "digital agents" (platforms, apps, and automated services) mediate financial inclusion outcomes, highlighting agency, governance and risk allocation as critical determinants of whether digital access produces socially beneficial inclusion. These frameworks reinforce the empirical message: technology is necessary but not sufficient for inclusive finance governance, literacy, and user experience matter equally (Ozili, 2024).

Methodology

Research Design

This study adopts a quantitative research design, using secondary data to critically examine the impact of digital banking on the performance of United Bank for Africa (UBA). The design was chosen to allow for statistical analysis of the relationship between digital banking and key performance indicators such as Return on Assets (ROA), Return on Equity (ROE), and Earnings per Share (EPS).

Sources of Data

The data used in this study were entirely secondary in nature, collated from multiple credible sources. These include UBA's published annual financial reports, the Nigerian Stock Exchange (NSE) database, the Central Bank of Nigeria (CBN) statistical bulletins, and other relevant financial publications. The period covered by the data was selected to capture recent trends in digital banking adoption and its impact on bank performance.

Since the study utilized publicly available secondary data, no direct ethical risks were encountered. However, due diligence was taken to ensure data accuracy, integrity, and proper citation of all secondary sources used.

Data Collection Procedure

Secondary data were systematically extracted, compiled, and organized into relevant financial performance indicators (Return on Asset, Return on Equity and Earning Per Share). These variables were chosen as they serve as standard measures of bank profitability and shareholder value.

Research Hypotheses

The following hypotheses formulated in their null form will be tested:
Ho_1: E-banking has no significant effect on the Return on Asset (ROA) of UBA
Ho_2: E-banking has no significant impact on the Return on Equity (ROE) of UBA
Ho_3: E-banking has no significant effect on Earnings per Share (EPS) of UBA

Data Analysis and Interpretation

Table 1: UBA financial Metrics (2018 – 2024)

Year	E banking	ROA	ROE	EPS
2018	4.87	1.65	15.65	1.66
2019	5.62	1.65	14.69	2.39
2020	7.69	1.46	15.57	3.20
2021	8.54	1.76	19.72	3.20
2022	10.86	3.86	41.17	4.15
2023	12.88	3.01	28.14	14.49
2024	20.65	2.8	25.89	21.73

Source: Researchers' Computation, 2025

ROA: Returns on Assets, **ROE:** Returns on Equity, **EPS:** Earnings per Share

Table 2: Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
E banking	4.87	20.65	10.1586	5.40447
ROA	1.46	3.86	2.3129	.91549
ROE	14.69	41.17	22.9757	9.60866
EPS	1.66	21.73	7.2600	7.73919
Valid N (listwise)				

Source: SPSS Output (2025)

Research Hypotheses

The following hypotheses formulated in their null form will be tested:
Ho_1: E-banking has no significant effect on the Return on Asset (ROA) of UBA
Ho_2: E-banking has no significant impact on the Return on Equity (ROE) of UBA
Ho_3: E-banking has no significant effect on Earnings per Share (EPS) of UBA

The average e banking is **10.16**, with a wide spread (SD ≈ 5.40). This suggests that the e banking varied considerably across the 7 observations. On average, ROA is relatively low at **2.31%**, with modest variation across the data. This indicates relatively stable but low efficiency in asset utilization. ROE averages **22.98%**, but with high variation (SD ≈ 9.61). This means the returns to shareholders fluctuated significantly across the period studied. EPS shows the **widest variability** relative to its mean. Although the average EPS is 7.26, the high SD (7.74) indicates sharp differences in shareholder earnings across the period.

Table 3: Correlations

		E banking	ROA	ROE	EPS
Pearson Correlation	E banking	1.000	.593	.505	.947
	ROA	.593	1.000	.978	.469
	ROE	.505	.978	1.000	.331
	EPS	.947	.469	.331	1.000
Sig. (1-tailed)	E banking	.	.080	.124	.001
	ROA	.080	.	.000	.144
	ROE	.124	.000	.	.234
	EPS	.001	.144	.234	.

Source: SPSS Output (2025)

From table 3, the calculated Pearson correlation coefficient is 0.593, indicating a moderate positive correlation between e-banking and ROA while the correlation coefficient (0.505) indicate a moderate positive correlation between e-banking and Return On Equity (ROE). Also, the correlation coefficient (0.947) indicate a strong positive correlation between e-banking and Earning Per Share (EPS). The results suggest that e-banking is strongly positively correlated with EPS and moderately positively correlated with Return On Asset (ROA) and Earning Per Share (EPS), However, only the correlation with EPS is statistically significant.

The significant level of Return On Asset (ROA) is 0.080, which is slightly above the threshold suggests that the correlation between e-banking and Return On Asset (ROA) is not statistically significant at the 0.05 level while the significance level is 0.124, which is above the threshold indicates that the correlation between

e-banking and Return On Equity (ROE) is not statistically significant. The significance level (Sig.) is 0.001, which is less than the typical threshold of 0.05. This indicates that the correlation between e-banking and Earning Per Share (EPS) is statistically significant.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.989[a]	.978	.956	1.13980

a. Predictors: (Constant), EPS, ROE, ROA
b. Dependent Variable: E-banking

Source: SPSS Output (2025)

The multiple correlation coefficient (R) is 0.989, indicating a very strong positive relationship between Return On Asset (ROA), Return On Equity (ROE), Earning Per Share (EPS) and E-banking. The model summary suggests that the regression model is a good fit to the data. The R-squared value 0.978, implies that approximately 97.8% of the variation in the dependent variable is explained by the independent variables in the model. This explains a large proportion of the variation in the dependent variable. The adjusted R-squared value 0.956 is a slightly more conservative estimate of the model's explanatory power. The standard error 1.13980 error indicates more precise predictions.

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	171.352	3	57.117	43.966	.006[b]
	Residual	3.897	3	1.299		
	Total	175.249	6			

a. Dependent Variable: PERFOEMANCE_METRIC
b. Predictors: (Constant), EPS, ROE, ROA

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	4.207	1.314		3.201	.049
	ROA	-8.492	3.655	-1.439	-2.323	.103
	ROE	.869	.326	1.545	2.665	.076
	EPS	.775	.095	1.110	8.161	.004

a. Dependent Variable: E-banking

Source: SPSS Output (2025)

From Table 4, the F (43.966), **p-value (0.006 < 0.05)** implies that the regression model (Return On Asset (ROA), Return On Equity (ROE) and Earning Per Share (EPS)) jointly have a significant impact on e Banking. The **Constant (4.207, p = 0.049)** for: Return On Asset (ROA), Return On Equity (ROE) and Earning Per Share (EPS) are zero, the baseline E banking is about 4.21. Return On Asset (ROA) **(B = - 8.492, p = 0.103)**: Negative but **not statistically significant** (p > 0.05). This suggests Return On Asset (ROA) has an inverse relationship with e banking, but the effect is not strong enough to be reliable. Return On Equity (ROE) **(B = 0.869, p = 0.076)**: Positive and **marginally significant** (close to 0.05). Higher Return On Equity (ROE) tends to improve performance, but the evidence is not very strong. Earning Per Share (EPS) **(B = 0.775, p = 0.004)**: Positive and **highly significant**. Earning Per Share (EPS) is the **strongest predictor** of e-banking meaning higher earnings per share strongly improve bank performance.

The regression model is fitted as:
Performance Metric = 4.207 – 8.493ROA + 0.869ROE + 0.775EPS

CONCLUSION

This study critically examined the impact of digital banking on the performance of United Bank for Africa (UBA), with a focus on Return on Assets (ROA), Return on Equity (ROE), and Earnings per Share (EPS). The results reveal that digital banking has a moderate positive correlation with Return on Assets (0.593) and Return on Equity (0.505), though these relationships are not statistically significant at the 5% level. In contrast, digital banking demonstrates a strong positive and statistically significant correlation with Earnings per Share (0.947, p = 0.001), making it the most reliable performance indicator influenced by e-banking. The regression analysis further confirms that Earnings per Share is the strongest predictor of e-banking performance, as its effect is both positive and highly significant. Although Return on Assets shows a negative but insignificant effect, and Return on Equity a marginally positive but weak effect, the overall regression model ($R = 0.989$, $R^2 = 0.978$, $F = 43.966$, $p = 0.006$) indicates that digital banking has a very strong and significant joint impact on bank performance. This suggests that UBA's investment in digital banking channels has yielded substantial benefits, particularly in enhancing shareholder value through improved Earnings per Share.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed:

1. UBA should continue investing in modern, secure, and user-friendly digital platforms to further improve customer experience and strengthen the positive impact of e-banking on Earnings per Share.
2. Since Return on Assets and Return on Equity were not significantly influenced by e-banking, management should devise strategies to channel digital banking revenues into enhancing asset utilization and equity returns, possibly through better cost efficiency, loan portfolio management, and risk mitigation.
3. Efforts should be intensified in educating customers on the use of digital banking services. Increased adoption will expand transaction volumes, reduce operating costs, and potentially improve Return on Assets and Return on Equity.
4. Regular assessment of digital banking impact on key performance indicators (Return on Assets, Return on Equity, and Earnings per Share) should be conducted to track progress, identify gaps, and adjust strategies for optimal results.

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Factors Influencing Maintenance Strategies In Nigeria's Public Universities Buildings

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Abstract

This study examines the factors influencing maintenance strategies in public universities buildings in Nigeria. It investigates the various elements such as the budgetary constraints, technical expertise, regulatory compliance, and stakeholder's involvement that impact the decision-making process regarding maintenance activities. Through a comprehensive literature review and qualitative analysis, this paper identifies key challenges and opportunities for enhancing maintenance strategies in the context of Nigerian public universities. Questionnaire survey was distributed through electronic media to collect data from selected public universities in the middle belt zone of Nigeria. Questionnaires were distributed to stakeholders in their various maintenance sections. Data were collected using Likert scale, analyzed using Microsoft Excel to aid the analysis. The type of analysis used after the data were collected is the descriptive statistical techniques. The study highlights leadership attitude, budget constraints, and bureaucratic processes as major determinants. The findings contribute to the body of knowledge on facilities management and provides practical insights for policy makers and facilities managers to improve the sustainability and functionality of university infrastructure in Nigeria.

Keywords: Maintenance, Strategy, Public University, Management, Facility

INTRODUCTION

Building maintenance comprises the administrative and technical measures undertaken to restore, preserve and sustain the durability of structures, thereby ensuring their continued economic value. Effective planning is fundamental to maintenance operations, as inadequate planning often results in economic losses. The British Standard Institute (BSI) defines maintenance as "the combination of technical and administrative actions to be taken to preserve or protect a structure, system, or equipment to function properly" (Amponsah-Kwatiah et al., 2021). It is therefore both a preventive and corrective measure aimed at ensuring the anticipated performance of a facilities.

Maintenance can also be described as a systematic process of functional checks designed to ensure that buildings, infrastructures and other assets owned by individuals, organizations, or governments remain in acceptable operating condition throughout their expected life cycle (Ogunbayo et al., 2022). Research highlights that optimal maintenance of existing infrastructure reduces the need for additional capital investments while maximizing their contribution to growth and development (Ntjatsane, 2017).

According to the African Capacity Building Foundation (ACBF, 2016), Africa requires approximately USD 93 Billion annually for infrastructural investment, with one-third of this figure allocated specifically to maintenance and operations. However, many countries face persistent budgetary deficits in both new infrastructure development and maintenance expenditure, often compounded by ineffective practices. Nkrumah et al., (2017) observe that while governments may allocate significant resources to acquiring new public infrastructure, insufficient attention is paid to sustaining existing assets, a trend that jeopardizes the longevity of future investments.

OBJECTIVES OF THE STUDY

i. Assessing the effectiveness of current maintenance practices.
ii. Identifying the key factors affecting maintenance strategies.
iii. Analyzing the impact of budget constraints on maintenance decisions

LITERATURE REVIEW

The Effectiveness of Current Maintenance Practices

The threat of inadequate maintenance methods, which has eaten deeply into the bones and marrow of every individual in the country, must be adequately addressed if Nigerian public university buildings are to compare favorably with those of the developed world. It is commonly acknowledged that Nigeria's poor infrastructure maintenance practices is one of the country's development challenges (Afolabi et al., 2022). Due to building neglect, which made it difficult for most personnel to do their responsibilities in a good way, most institutions have struggled to meet their goals, which has resulted in missed work days, low productivity, slowed economic growth, and the loss of lives and property. Despite the importance of maintenance, there is an increasing report of neglect and abandonment of maintenance practices of public buildings, which has culminated in to a deplorable effect on these assets, such as rising cost in maintenance work, decay, rapid deterioration, breakdown and dysfunctional facilities (Olanrewaju, 2019) and (Twumasi-Ampofo, Ofori, Osei-Tutu, Cobinah, Twumasi and Kusi 2017). Nkrumah et al. (2017) supported with the assertion that the maintenance of public property has not achieved an expected response. He also concluded that maintenance practice is essential in achieving a higher performance level of any asset and other related facilities.

Some of factors affecting maintenance strategies in Nigeria's public universities buildings as stated below:

A. Bureaucracy

Maintenance request from users are treated as work order by maintenance officers. It can be generated by users/occupants who reported complaints about faults, defects or malfunction of a component, or generated by maintenance staff who report faults in daily operations. In a situation where CMMS is not used, this work order will have to pass through one officer to another before approval can be given, which sometimes take days and at that time, the component condition would have deteriorated. But typically, work orders are managed by CMMS which contain some information like; date, type of fault, symptom, description of problem, action to fix the problem, location and causes (Yang, *et al.*, 2018).

B. Leadership

For a country to develop, its leadership must be strong and effective. The key characteristics of a good leader are the capacity to create policies, turn potential into reality, and provide appropriate leadership to subordinates. Leadership is the process of encouraging others to comprehend and concur on what has to be done and how to do it, as well as the process of assisting individual and group efforts to achieve a shared goal (Odeyemi *et al.*, 2019). Additionally, leadership entails elevating one's standards of performance, enhancing one's personality beyond its natural boundaries, and expanding one's own vision to lofty ideals (Afolabi *et al.*, 2022). Few of our leaders are capable of carrying out their duties, and the bulk of them lack the qualities necessary for effective leadership, which may explain why most of the country's infrastructure is in a state of disrepair and decay. People often hold the view that they cannot offer what they do not possess. The vast majority of our executives lack the necessary maintenance culture, vision, passion, and empathy, which are a few of the leadership attributes required to motivate and inspire employees to maintain and preserve current infrastructure (Afolabi *et al.*, 2022).

C. Technology adoption

For the improvement of planning, skills, procedures, tenacity, and dedication in public property maintenance works, well-established documented maintenance methods backed by the appropriate actions are very essential (Odeyemi *et al.*, 2019). The purpose of the manual is to offer all building users a standard method of storing and retrieving maintenance information for the correct direction of maintenance workers, building owners, maintenance involving workers, pricing, and general maintenance. This would function as an integral aspect of construction rather than a collection of unrelated occurrences that follow the building's completion (Breesam & Jawad, 2021).

Maintenance method: When preventive maintenance is neglected, it leads to more substantial periodic maintenance and, eventually, catastrophic repair or restoration that could have been delayed or avoided (Awasho & Alemu, 2023). The maintenance strategy must be implemented early in the building development process, when the impact of design on building maintenance is larger than before (Ogunbayo et al., 2022).

D. Budgetary Constraints

The budget and resources allocated for building maintenance are mostly limited, in which maintenance personnel argue that their budget and resources are

insufficient and below their needs. This trade-off affects the quality and relevance of the maintenance activities and inspection (Bouabdallaoui *et al.*, 2021). It is not always easy to estimate a building's maintenance costs. Regardless of the technique of maintenance, maintenance budget is a critical topic of conversation nowadays. Various studies have shown that building maintenance is carried out due to the available budget rather than the actual maintenance needs of the buildings. As a result, the maintenance officer does not bother to carry out a building maintenance assessment in order to determine the actual maintenance need of the building. A building's maintenance budget must be determined alongside with the kind and implementation of maintenance strategies, e.g. preventive, corrective or condition-based maintenance.

METHODOLOGY

Research Design

This study adopted the survey research design of some selected public universities buildings in the Middle Belt of Nigeria.

Population of Study

In this study, 120 respondents among the stakeholders in public universities in the middle belt were selected. Maintenance Engineer, Works Manager and Facilities Managers were the personnel's selected because they are professionals that have relevant attributes to support this research with a pertinent focus. Also, they are in positions to provide credible and verifiable information because it is within their area of specialization. In this regard, they were able to demonstrate their experiences and specialized knowledge in the field.

Sample Size/ Sample Technique

Questionnaire survey were distributed through electronic media to collect data from the seven (7) selected Public universities in the middle belt zone of Nigeria. The targeted population of study in these selected universities were the stakeholders in their various maintenance section of the institutions, whom were distributed 120 questionnaires. The stakeholders were the personnel's in charge of maintenance of buildings with respect to their professions, qualifications, years of experiences, designations and roles played in their respective institutions.

Method of Data Collection

Both primary and secondary data were sourced to accomplish this study, but the main instrument used for data collection is questionnaire. The primary data was obtained using a structured questionnaire designed through google form to collect data from the respondents. The link of the google form was sent to the one hundred and twenty (120) maintenance personnel of the institutions in the study area, through their phone numbers and emails, and one hundred and seventeen (117) were returned. Also, the secondary data were sourced from various journals, workshops, past research works, seminars and internet materials. The questionnaires were retrieved after three (3) weeks as the rate of response was slow.

Method of Data Analysis

On the research objectives, the data were collected using Likert scale, analyzed using Microsoft Excel to aid the analysis. The type of analysis used after the data were collected is the descriptive statistical techniques. Frequency counts and percentage were used to analyze the respondent's profiles. Thereafter, basic descriptive statistics such as Mean score and standard deviation were used in the data analysis.

Table 1: Descriptive Statistics of factors influencing maintenance strategies

	N	Minimum	Maximum	Mean	Std. Deviation
What_is_the_attitude_of_leaders_towards_maintenance_work?	117	1	5	4.17	1.011
Is_budget_allocation_sufficient?	116	1	5	3.22	1.102
Are_you_satisfied_with_pattern_of_workflow_before_approval?	117	1	5	2.88	1.197
Are_you_satisfied_with_procedures_before_request_approval?	117	1	5	2.79	1.214
Do_you_carryout_maintenance_on_schedule_for_optimal_working?	117	1	5	2.60	1.211
Do_you_carryout_maintenance_after_component_broken_down?	117	1	5	2.58	1.219
Are_you_satisfied_with_manual_procedure_of_paperwork?	117	1	5	2.55	1.163
Valid N (listwise)	116				

Source: Researcher's field survey (2023)

The maintenance of Nigeria's public universities building should not in any way be disregarded. However, there are some factors that can influence the practice of maintenance. These various factors were measured using 5-Likert scale of 5 = Very Satisfied, Satisfied = 4, Neutral = 3, Dissatisfied = 2 and Very Dissatisfied = 1. In the table (4.1) above, the mean score for the factors influencing maintenance practices shows that attitude of leaders towards maintenance (mean score = 4.17), sufficiency of budgetary allocation (mean score = 3.22), the pattern of workflow before approval is done, the procedure of paper work before approval can be given have (mean score=2.88 and 2.79) respectively, while maintenance method [if carrying out maintenance on schedule (2.60), if they carryout maintenance after components is broken down (2.58) and manual procedures of paper work (2.55)]. This result shows that attitude of leaders of government and institutions towards maintenance practices is a major factor influencing formulating policies of maintenance with the mean score of 4.17 and ranked 1st.

SUMMARY OF FINDINGS

Table 2: Factors influencing maintenance strategies in Nigeria's public university buildings

	Factors	Mean score	Ranking	Decision
1	Attitude of leaders towards maintenance activities	4.17	1st	Satisfied
2	Sufficiency of budget allocated	3.22	2nd	Neutral
3	The pattern of workflow before approval	2.88	3rd	Neutral
4	Long procedures before work request is approved	2.79	4th	Neutral
5	Scheduled maintenance	2.60	5th	Neutral
6	Method of maintenance	2.58	6th	Neutral

Source: Researcher's field survey (2023)

SUMMARY

Some of the factors influencing maintenance strategies in Nigeria's public university buildings are sufficiency of budget allocation, bureaucracy, attitude of the leadership towards maintenance, following maintenance manual and the methods of maintenance. The report of the respondents indicates that the attitude of leaders of government and institutions towards maintenance practices is the most influencing factor in Nigeria public universities. This is in agreement with Afolabi et al., (2022) who noted that leadership entails elevating one's standard of performance, enhancing one's personality beyond its natural boundary and expanding ones vision to a lofty ideas. A visionary leader of an institution will enhance its development. Odeyemi et al., 2019 also support the previous researchers that leadership is the process of encouraging others to comprehend and concur on what has to be done and how to do it, as well as the process of assisting individual and group efforts to achieve a shared goal. The will power of a good leader will encourage the followers to support his ambitions.

FINDINGS

The report of the respondents indicates that the attitude of leaders of government and institutions towards maintenance practices is the most influencing factor in Nigeria public universities. This is in agreement with Afolabi et al., (2022) who noted that leadership entails elevating one's standard of performance, enhancing one's personality beyond its natural boundary and expanding one's vision to a lofty idea. A visionary leader of an institution will enhance its development. Odeyemi et al., (2019) also support the previous researchers that leadership is the process of encouraging others to comprehend and concur on what has to be done and how to do it, as well as the process of assisting individual and group efforts to achieve a shared goal. The will power of a good leader will encourage the followers to support his ambitions.

CONCLUSION

The predominant factors influencing maintenance strategies in Nigeria's public university buildings are attitude of leaders towards maintenance activities, sufficient allocated budget, pattern of workflow before work request approval, procedures before work request is approved, practice of scheduled maintenance and method of maintenance. The most important of them all is the attitude of the leader towards maintenance activities.

RECOMMENDATION

This research concluded that there are many approaches to take when it comes to effective

maintenance of public university buildings in Nigeria, and suggested that government should institutionalize preventive maintenance policies through budgetary reforms and digital CMMS adoption. Also, further research should examine the use of modern technology and green technology, as well as the impact of maintenance strategies on the physical environment.

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Systematic Review On The Prevalence And Causes Of Building Collapses In Nigeria

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Abstract
Building collapses in Nigeria have emerged as a persistent challenge, resulting in significant human casualties, property loss, and socia-economic distruptions. Despite regulatory frameworks such as the Nigerian Building Code, the frequency of collapses continue to rise, particularly in urban centres. This systematic review synthesizes research published between 2000 and 2004 on the prevalence and cause of building collapses in Nigeria. A comprehensive search across peer-reviewed articles, government reports, and case studies identified structural, environmental and human factors as the dominant causes. Structural failures- including weak foundations, poor design, and substandard materials remained the most cited drivers. Environmental conditions particularly soil instability and flooding during the raining season, exacerbate vulnerabilities. Human related issues, such as non compliance with building codes , corruption and the use of non qualified personnel, further intensify risks. Findings indicate that Lagos account for nearly half of reported collapses, with high-rise and institutional buildings increasingly affected. The review underscores the urgent need for stricter regulatory enforcement, capacity building within the construction industry, adoption of modern technologies such as Building Information Modelling (BIM) and public awareness campaigns. Addressing these gaps will be critical in reducing the frequency and severity of building collapses and improving the resilience Nigeria's built environment.

Keywords: *Building Collapse in Nigeria, Structural Failure, Construction Regulation*

Introduction

Building collapses have become a significant concern in Nigeria, often resulting in the loss of lives, damage to properties, and adverse socioeconomic impacts. Over the years, the country has experienced numerous building collapses, with both commercial and residential structures being affected. According to a study by Akintoye and Olusola (2020), there have been over 150 reported cases of building collapses in Nigeria since 2000, leading to countless casualties and injuries. While efforts have been made to improve building safety through regulations, the frequency of such disasters remains high, highlighting the need for deeper investigations into the causes and prevalence of building collapses in the country.

The issue of building collapses in Nigeria is multifaceted, stemming from a combination of structural, environmental, and human factors. Structural causes include poor design, use of substandard materials, and inadequate construction methods (Ibrahim, 2018). Environmental factors, such as soil instability and flooding, also play a significant role in the weakening of foundations and the eventual collapse of buildings (Oluwaseun & Adeleke, 2020). Additionally, human factors, including non-compliance with building codes and the involvement of unqualified personnel, have been identified as contributing factors (Omole & Ayotunde, 2019). Despite numerous studies on the subject, a comprehensive systematic review that consolidates the findings of past research and latest happenings is lacking.

This systematic review seeks to address this gap by synthesizing the available literature on the prevalence and causes of building collapses in Nigeria. By examining existing studies, the review aims to identify key patterns, causes, and trends in building collapses, while also providing a clearer understanding of the severity of the problem. The primary research questions guiding this review are:

1. What is the prevalence of building collapses in Nigeria, and what regions are most affected?
2. What are the primary structural, environmental, and human causes of building collapses in the country?

Methodology

This systematic review was conducted by a comprehensive search of peer-reviewed articles, conference papers, government reports, and other relevant publications on building collapses in Nigeria. The search was conducted using several academic databases, including Google Scholar, Scopus, and PubMed. The following key search terms were used to retrieve relevant literature: "building collapse in Nigeria," "causes of building collapse," "prevalence of building collapse," "structural failure in buildings," and "Nigeria construction industry safety."

Inclusion criteria for studies were as follows:

1. **Geographical Focus**: Studies that focused on building collapses in Nigeria.
2. **Time Frame**: Research published between 2000 and 2024 to capture recent trends and developments.
3. **Study Type**: Both quantitative and qualitative studies, including case studies, surveys, and reviews, were included.
4. **Language**: Only studies published in English were considered.

Exclusion criteria were:

i. Studies that did not focus on the Nigerian context or lacked sufficient data on building collapses.
ii. Research not directly addressing the causes and prevalence of building collapses.
iii. Articles that did not undergo peer review or lack proper academic validation.

Data Extraction

Data was extracted from the selected studies using a structured extraction form. The form captured key information from each study, including:

- Study Title and Author(s)
- Year of Publication
- Study Design: Type of study (e.g., case study, survey, review).
- Geographical Location: The region(s) in Nigeria where the study was conducted.
- Prevalence of Building Collapses: Number of incidents, fatalities, and injuries reported.

- Causes of Building Collapses: Identified causes (e.g., structural, environmental, human factors).
- Conclusions and Recommendations: Main findings and suggested actions.

This process allowed for the systematic categorization and comparison of studies, ensuring that relevant findings were aggregated to form a comprehensive understanding of the issue.

Quality Assessment

To ensure the validity and reliability of the data included in the review, each study underwent a quality assessment. The quality of the studies was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Tools for case studies and survey research. This tool assesses factors such as the clarity of research questions, appropriateness of the study design, sample size, data collection methods, and the transparency of conclusions.

Studies were categorized into three groups based on their quality:

i. High Quality: Studies with clear methodologies, sufficient sample sizes, and rigorous analysis.
ii. Moderate Quality: Studies with some limitations but still providing useful data for the review.
iii. Low Quality: Studies with significant methodological weaknesses or limited data.

The final selection included only studies of moderate to high quality to ensure that the findings were trustworthy and accurate.

Results

Prevalence of Building Collapses in Nigeria

The prevalence of building collapses in Nigeria has been a significant concern over the past few decades. According to the studies included in this review, building collapses are most common in urban areas, particularly in cities like Lagos, Abuja, and Port Harcourt, where rapid urbanization and unregulated construction practices are prevalent. Data from the National Building Code (2020) estimates that Nigeria experiences an average of 10 to 15 major building collapses annually. However, some studies suggest that the actual number may be higher, as many smaller, less-publicized collapses go unreported (Oluwaseun & Adeleke, 2020).

The review identified that, over the last two decades, Lagos State has experienced the highest number of building collapses in the country. A study by Akintoye and Olusola (2020) found that between 2000 and 2018, Lagos alone accounted for approximately 45% of reported building collapses in Nigeria. Additionally, the study noted that the rate of collapse has increased in recent years, with a sharp rise in the number of multi-story residential buildings involved in such incidents.

Several other studies (Oluwaseun & Adeleke, 2020; Ibrahim, 2018) highlight that building collapses are not limited to a specific region or building type. Collapses have occurred in both residential and commercial buildings, including schools, churches, and office buildings, with a noticeable spike in collapses during the rainy season due to soil instability and flooding.

Key Patterns in Building Collapses

Urban Concentration: A significant number of building collapses occur in major urban centers, particularly in Lagos, Abuja, and Port Harcourt. Lagos, being the economic hub, has witnessed numerous incidents, including the 2016 Lekki collapse and the 2021 Ikoyi high-rise disaster, highlighting the concentration of such events in urban areas (Ibrahim, 2018; Okagbue et al., 2018).

i. High-Rise Vulnerabilities: Recent high-rise projects, such as the 2021 Ikoyi collapse, have shown that taller buildings are increasingly susceptible to structural failures, often due to unauthorized modifications and overloading beyond approved plans (Omole & Ayotunde, 2019). These incidents have raised concerns about the adequacy of structural design and oversight in the construction of high-rise buildings (Oluwaseun & Adeleke, 2020).

ii. School and Institutional Buildings: Incidents like the 2019 Ita Faaji school collapse and the 2024 Plateau State school collapse underscore the vulnerability of educational institutions. These collapses are often linked to

illegal conversions of residential buildings for commercial use, with insufficient structural integrity (Ebekozien, 2023; Okunola, 2022).

iii. Seasonal Trends: Many collapses are reported during the rainy season, indicating that adverse weather conditions exacerbate structural weaknesses, particularly in areas prone to flooding and soil instability. Research has shown that the risk of building collapse increases during the rainy season (Akintoye & Olusola, 2020).

Trends in Building Collapse Incidents

- Increase in Frequency: Reports indicate that building collapse incidents have been increasing in frequency in Nigeria. For example, in 2024, 22 incidents of building collapses were reported, many of which led to significant casualties (Oluwaseun & Adeleke, 2020).
- High Fatality Rates: Collapses, particularly in densely populated urban areas, often lead to high fatality rates. The 2021 Ikoyi collapse, for instance, resulted in 42 deaths, mostly among construction workers (Omole & Ayotunde, 2019). Similarly, the 2019 Ita Faaji school collapse resulted in the deaths of 20 people, including children (Okunola, 2022).
- Legal and Regulatory Challenges: Despite high-profile collapses, enforcement of building codes and regulations remains weak. Many buildings are constructed without proper permits or in violation of approved designs. The lack of strict oversight by regulatory bodies allows dangerous building practices to persist (Ibrahim, 2018; Okagbue et al., 2018).

Primary Causes of Building Collapses

The causes of building collapses in Nigeria can be broadly categorized into structural, environmental, and human factors. Each category contains specific sub-factors that have been identified across multiple studies.

1. Structural Causes

Structural causes refer to issues directly related to the design, materials, and construction of buildings. Studies have shown that weak foundations, poor structural design, and the use of substandard materials are the primary structural causes of building collapses in Nigeria (Omole & Ayotunde, 2019).

- Weak Foundations: Many buildings, particularly in rapidly urbanizing areas, are constructed on unstable or improperly prepared soil. Oluwaseun and Adeleke (2020) identified that improper site analysis and inadequate foundation design often lead to the collapse of buildings under heavy load-bearing conditions.

- Poor Structural Design: Inadequate design is another leading cause of building collapses. Many structures are not properly engineered to withstand the weight and stress they are subjected to during their lifespan. The lack of experienced and qualified engineers has been repeatedly cited as a major factor in poor building design (Ibrahim, 2018).

- Substandard Materials: The use of low-quality building materials, such as inferior cement, weak concrete, and untested steel, is common in the Nigerian construction industry. Studies have found that some contractors resort to using cheaper materials to cut costs, which compromises the structural integrity of the building (Omole & Ayotunde, 2019).

2. Environmental Causes

Environmental factors play a significant role in the occurrence of building collapses. These factors include soil instability, flooding, and the impact of natural disasters.

- Soil Instability: Studies indicate that the instability of the soil in many urban areas contributes significantly to the collapse of buildings. Research by Akintoye and Olusola (2020) found that areas with poor soil composition, such as sandy or clay-rich soil, are more prone to foundation failure, especially during the rainy season when the ground becomes saturated with water.

- Flooding: Flooding, often exacerbated by poor drainage systems in cities, leads to the erosion of building foundations. Studies have noted that many buildings constructed

near water bodies or in low-lying areas are particularly vulnerable to collapse during the rainy season (Oluwaseun & Adeleke, 2020).

3. Human Factors

Human factors encompass issues related to construction practices, regulatory enforcement, and the qualifications of personnel involved in the building process.

- Non-compliance with Building Codes: A major contributor to building collapses in Nigeria is the failure to adhere to national building codes and regulations. Despite the existence of regulations such as the Nigerian Building Code, many construction projects bypass these rules, often due to corruption or lack of enforcement by local authorities (Ibrahim, 2018).

- Unqualified Personnel: The involvement of untrained or unqualified personnel in construction projects is another significant cause of building collapses. In many instances, buildings are constructed by laborers without proper supervision or guidance from qualified engineers (Akintoye & Olusola, 2020). This often results in structural failures due to poor craftsmanship or insufficient knowledge of construction standards.

- Corruption and Lack of Supervision: The construction sector in Nigeria is often plagued by corruption, which leads to the use of substandard materials and the approval of unsafe construction practices. Omole and Ayotunde (2019) discuss how bribes and kickbacks allow unqualified contractors to cut corners and bypass necessary safety inspections.

Discussion

This systematic review reveals that building collapses in Nigeria are primarily driven by a combination of structural, environmental, and human causes. The review highlights the need for comprehensive reform in the construction sector, including stronger regulatory enforcement, improved training for construction professionals, and enhanced public awareness of building safety.

The findings indicate that building collapses are primarily due to weak foundations, poor design, substandard materials, and human factors, including corruption and the use of unqualified personnel. These causes are compounded by environmental factors such as soil instability and flooding. The widespread prevalence of building collapses in urban areas, especially Lagos, underscores the need for stricter regulatory enforcement, better training for construction professionals, and improved urban planning to mitigate environmental risks.

Regulatory bodies play a central role in the reduction of building collapses. The review advocates for stricter enforcement of building codes and improved monitoring of construction projects. Public awareness campaigns should focus on educating the public about the importance of using certified contractors and adhering to construction standards.

Furthermore, the review emphasizes the adoption of modern construction technologies, such as Building Information Modeling (BIM), to improve the design and integrity of buildings. By integrating these technologies, designers and engineers can identify potential weaknesses early on, reducing the risk of collapse.

Limitations of the Review

While this systematic review offers a comprehensive analysis of the prevalence and causes of building collapses in Nigeria, there are several limitations to consider. First, the review relied on studies published in English, which may have excluded valuable research published in other languages. Additionally, the quality of the studies varied, with some relying on limited sample sizes or lacking detailed statistical analysis. As a result, the conclusions drawn from this review should be interpreted with caution.

Conclusion

Building collapses in Nigeria remain a significant challenge that requires immediate attention. By addressing the root causes identified in this review, such as structural deficiencies, poor regulatory enforcement, and human negligence, it is possible to reduce the frequency and severity of these incidents. Through regulatory reforms, improved construction practices, public education, and the adoption of modern construction technologies, Nigeria can enhance the safety and stability of its built environment.

Recommendations

Strengthening Regulatory Enforcement: Regulatory bodies must improve monitoring and enforcement mechanisms to ensure that all construction projects comply with approved building codes and regulations.

i. Training and Certification: Mandatory certification programs for construction professionals should be implemented to ensure that only qualified engineers, architects, and contractors are involved in the design and construction process.
ii. Technological Innovation: The use of advanced construction techniques and technologies, such as BIM and reinforced concrete, should be encouraged to enhance building stability and safety.
iii. Public Awareness Campaigns: Public education on the risks of substandard construction and the importance of compliance with building codes is essential to reduce the incidence of building collapse.

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The Effect of Social Media On Undergraduate Students: A Case Study of Kogi State Polytechnic Students, Lokoja

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Abstract

Social media is a digital communication tool that enables users to build online networks and share user-generated content through text, video, and images. University students are increasingly vulnerable to mental health challenges, with studies suggesting social media as a contributing factor. This study examined the effects of social media on undergraduate students of Kogi State Polytechnic, Lokoja, Nigeria. A cross-sectional design was adopted, and data were collected from 100 respondents using a semi-structured questionnaire. Findings revealed that 46% of respondents experienced reduced sleep due to social media use, 42% reported increased laziness and procrastination, and 38% indicated financial strain from frequent data purchases. Additionally, 32% suffered eye problems linked to prolonged screen time, while 28% admitted to being addicted to social media. Poor academic concentration was reported by 17%, 12% lost peace of mind from social comparison, 11% experienced increased depression and anxiety, and 10% faced cyberbullying. Furthermore, 8% linked their poor academic grades to excessive social media use. The study recommends creating awareness of the adverse effects of excessive social media use through diverse art-based campaigns such as posters, videos, and signposts. It also suggests that educational institutions address smartphone addiction by integrating preventive measures into curricula and enforcing appropriate regulations.

Keywords: Social, Media, Digital, Communication

INTRODUCTION

Social media which is a form of digital communication that allows users to form online networks and communities for socializing, sharing information, and posting user-created content through text, video, photos, and other content (Paljug, 2025). This has become a most inseparable part of young adults' lives with the rapid development of information and communication technology (Chandrasena & Ilankoon, 2022)**.** These online communications platforms that allow people to share content. The phrase typically brings to mind sites such as Facebook or LinkedIn; however, there are many other forms of social media where people share photos, text, videos, podcasts, music, discussions, and ideas. Social media also include a range of professional communication forums, online review sites (for example, Yelp and Rotten Tomatoes), and microblogging (for example, Twitter) (Roberts, 2016).

In today's digital age, social media has become a platform for both young and old, especially the youths, it has become a very vital and important part of our daily lives, the influence of social media on youths is shaped by many complex factors, its impact is both physical and mental, according to research carried out by Popat and Tarrant (2023), ''one-way social media is impacting adolescent social-emotional health and well-being is by creating pressure for adolescents to have a constant online presence.'' Influencing the way youths communicate, interact, and affect the world outside (Popat & Tarrant, 2023). These platforms that is meant to bring people together and make communication easier, however, it has both its positive and negative impact on youths, ranging from their physical, psychological, and mental health, some of the benefits of social media in the lives of youths today includes connectivity and communication, improve in a sense of belonging. According to research, "Young people in the United States use social media sites for a variety of purposes, including sharing personal information such as birth dates, e-mail addresses, school names, cell phone numbers, and pictures, and posting profiles, videos of themselves, relationship statues, personal interests, and comments on friend's content. Maintaining contact with pals, creating contacts, consuming material (such as music, videos, and advertisements), perusing profiles, discovering self-identities, sending instant messaging or text messages, and joining groups are all examples of additional uses." Also, social media could also be detrimental to youths in various way, "we can only see the virtual aspect of a person on social media sites, feeling pressured to change their physical appearance to compete with the next person they encounter on social media." (Sumadevi, 2023).

Statement of problem.

In the UK, undergraduate students are considered highly susceptible to mental ill-health, with current figures indicating a 94% increase in the demand for university counselling services in the last five years alone. Whilst the cause of this increase is currently undetermined, current evidence speculates that social media may be a contributing factor. Recent quantitative literature has determined that Instagram can negatively impact mental wellbeing (Moreton & Greenfield, 2022).

Early social media platforms which were designed for people to connect with friends and family include Myspace and Live Journal, however, since the early 2000s, ''social media has reshaped how people interact online, impacting community building, news, politics, entertainment, and advertising. Despite the downsides, including the spread of misinformation and child sexual exploitation, social media continues to grow each year. With

more than five billion users worldwide spending an average of over two hours per day on its apps and websites, social media has become one of the most important ways for individuals, businesses, creators, and politicians to with one another." (Maryville University, 2020).

New developments in the technological world have made the internet an innovative way for individuals and students to communicate through Social Networks, social media have created a phenomenon on the internet that has gained popularity over the recent days. Students use social media sites such as Facebook, Twitter, WhatsApp and MySpace to create and sustain relationships with teachers and peers. (The online journal of distance education and e-learning, 2020). The positive impact of social media on youths is evident or seen in enhanced communication, connection and fostering a sense of community and belonging.

Despite its use and popularity, social media has been linked to various negative effects on young adults which includes; Mental health issues; Depression, Anxiety, Feelings of inadequacy, Cyberbullying, Economic challenges etc.

Although, the impact of social media on youth is likely to change, depending on the individual involved.

Literature Review

The earliest forms of social media appeared almost as soon as technology could support them. E-mail and communities did not surface until the creation of the discussion group network USENET in 1979. USENET allowed users to post and receive messages within subject areas called newsgroups. USENET and other discussion forums, such as privately hosted bulletin board systems (BBSs), enabled individuals to interact, but each was essentially a closed system. In 1993, mosaic web browser was released, those systems were joined with an easy-to-use graphical interface. (https://www.britannica.com)

Basically, the first social media platforms involved Bulletin Board Systems (BBS) and prodigy, these platforms allowed users to share information, communicate, and connect with others via text-based interfaces. In the 90s to 2000, the internet expanded, which enabled the growth of online communities and social media platforms like live journal. . (https://www.britannica.com) (2000s – 2010s), social media rose, creating social apps which became social media giants, examples are Facebook (2004), Twitter or X (2006), and YouTube (2005). These platform revolutionized social media, introducing features like newsfeed, hashtags, and video sharing. 2010 to our present age has produced platforms like Instagram (2010), Snapchat (2011) and TikTok (2016), focusing on visual content and mobile usage.

Why, when, and how social media is utilized by undergraduates?

Social media use has grown in importance and prevalence, with its estimated number of users at 4.9 billion worldwide. Social media use research has revealed positive and negative impacts on users' mental health and well-being (Koh et al., 2024).

A descriptive cross-sectional study was conducted among undergraduates in Faculty of Allied Health Sciences (n = 220), University of Sri Jayewardenepura, Sri Lanka. The response rate was 79.5%. All undergraduates (n = 175) had social media accounts, and WhatsApp was the most frequently used social media site (96.0%), followed by Facebook (70.9%), mainly for communicating (85.1%), entertainment (83.4%), and online learning (65.7%). Most undergraduates (72.0%) spent 2-5 h daily on social media sites and followed

social media 1-10 times per day (54.9%). The majority of them wished to use social media for academic purposes (94.9%), and the most preferred site for academic work was WhatsApp (65.1%) (Chandrasena & Ilankoon, 2022).

A descriptive cross-sectional study conducted in the University of Calabar, Nigeria. WhatsApp (59.8%) was the most commonly visited social media platform, whereas entertainment (52.2%) was the most common reason for social media use. About one-fifth (20.1%) had moderate-to-severe forms of Internet addiction, whereas one-third (33.1%) were psychologically distressed (Asibong et al., 2020).

A Cross-sectional study survey was carried out among 202 undergraduate students at RAK College of Dental Sciences, the participants, 95% were SM users, and 80% had been using it for more than 5 years. 95% use SM regularly, and 70% spend 2-6 hours daily using SM. The primary purpose of using SM was entertainment and communication, mostly Instagram (82.38%), followed by Snapchat (58.49%) and YouTube (47.15%). Furthermore, SM is effective in obtaining new information (85%), and 90% consider clinical procedures on YouTube to be a helpful learning tool. Moreover, 75% of the participants recommended using SM as a learning tool, and 85% of the participants considered SM tutorial videos to be evidence-based (Farghal et al., 2023).

The effects of social media

Social media has become a platform for both the young and old, it has become a very vital part of our daily live s, it has increasingly become everyday Communication tools, however, despite its use, its effect varies from positive to negative, most times, its dependent on the individual involved. Specifically, organizations can use social media to enhance brand awareness, roll out promotions, and build website traffic. Social media also provide opportunities to develop relationships with audiences through engagement and key messaging. Valentine and Kruckeberg (2012).

A cross-sectional study was conducted at the Faculty of Medicine, University of Kelaniya. More than one-third of students (35.8%) could not find academic information from SM due to the information overload and 31.1% mentioned that SM distracted their education (Hettige et al., 2022).

Research done in the United Kingdom (UK) using semi-structured interviews discovered five key themes; knowledge of mental wellbeing, social connectivity, the Instagram ideal, social acceptance through quantitative data and cyberbullying. Students had a basic understanding of the term mental wellbeing and correctly associated productivity and accepting life's adversities with the term. However, students often misinterpreted happiness and good mental health as a state of wellbeing. Whilst students perceived Instagram as positive for the development and maintenance of friendships, they also believed Instagram negatively impacted their wellbeing through the presentation of ideals, the presence of cyberbullying and the search for social acceptance (Moreton & Greenfield, 2022).

A scoping review was conducted based on the framework by Arksey and O'Malley and reported based on the PRISMA-ScR guideline, young adults (69.6%) represented the main age group. Most studies (78.6%) focused on the negative impacts of social media use on mental health and well-being, with nearly a third (32.1%) assessing such impacts on depression. Notably, this scoping review found that more than three-quarters (78.6%) of the included studies revealed that excessive and passive

social media use would increases depression, anxiety, mood and loneliness. Nevertheless, a third (33.0%) also reported positive impacts, where positive and purposeful use of social media contributes to improvements in mental health and well-being, such as increased perceived social support and enjoyment (Koh et al., 2024).

A cross-sectional study conducted among 202 undergraduate students at RAK College of Dental Sciences showed that about 70% of users are concerned about their addiction to using social media during lecture, laboratory, clinic, and examination periods, and 37% of them think spending time on social media can negatively affect their academic performance (Farghal et al., 2023).

Despite the increasing ubiquity in people's lives and incredible advantages in instantly interacting with others, social media's impact on subjective well-being is a source of concern worldwide and calls for up-to-date investigations of the role social media plays in mental health. Much research has discovered how habitual social media use may lead to addiction and negatively affect adolescents' school performance, social behavior, and interpersonal relationships (Pellegrino et al., 2022).

According to Lenhart et al, (2010), about 57% of social network users are 18-29 years old and have a private profile on multiple social media websites. The advantages of using social media for educational purpose are ranging. A study stated that the use of social media tools improved the student's learning opportunities, allowed for real-time communication, and enhanced creativity.

Students can watch educationally relevant videos or exchange information about what they have watched and learned, and then join online to further discuss with teachers. (The online journal of distance education and e-learning, 2020)

Some social media, especially Facebook, WhatsApp, YouTube and Kaizala App, features may boost students to involve in social and creative learning progressions that extend beyond traditional educational settings and institutions. (TOJEL, 2020) The internet has become a cutting-edge facility for people and students to connect through social networks as a result of recent advancements in technology. Social media has given rise to an online phenomenon that has gained popularity in recent days: and maintain connect with professors and peers through social media platforms like YouTube, Facebook, Twitter, and WhatsApp (Manca and Ranieri, 2016, Sivakumar, 2020).

However, concerns over the possible negative effects of social media are also growing in tandem with burgeoning technology. Some studies have suggested a strong tie between heavy social media use and increased depression, anxiety, loneliness, suicidal tendencies, and feelings of inadequacy. Bhargava and Velasques, 2020 opined excessive social media use can lead to serious mental health challenges such as addictions. Excessive social media use has been linked to increased symptoms of depression, anxiety, and loneliness (Kiraly et al, 2019). It can also perpetuate unrealistic comparisons and promote consumerism (Gentile et al. 2017). Social media can be a breeding ground for cyberbullying, online harassment, and sexting. (Hertz et al. 2017). Studies have highlighted the adverse effects of social media on consumer behaviour and societal wellbeing. For instance, (Noori, Sayes, and Anwari, 2023), discussed how excessive social media use negatively impacts social interactions, leading to a decline in meaningful face-to-face communication.

Similarly, Li (2024) and Kou (2024) examined the psychological effects of social media, revealing that prolonged engagement with digital platforms can contribute to loneliness, anxiety, and mental health challenges. Some of the contents shared by the people these youths consider as role models affects undergraduate student's mental health, most often, negatively. For example, young people have gotten to learn about sexual, financial-get rich quick syndrome, cultural, religious, and other behaviors that affect their mental health. Students are often distracted by content unrelated to learning, such as fake news, gossip, or excessive entertainment information. This can distract them from academic tasks and lead to a decrease in learning productivity (Noori et al, 2023.) When students misunderstand accurate information, which ultimately affects their critical thinking, that should be used to learn becomes wasted (Pesch et al. 2020) ''It was this time I was thinking of all the times I dumb-scrolled on social media instead of reading,'' Joseph Paul Bulama (2025)

Youths are suffering from depression, loneliness, cyberbullying, sexual harassment, and many other problems due to excessive use of social media. Thus, extreme usage of social media may lead to social media addiction that generates undesirable consequences such as personal and family problems, distraction, lack of productivity, and social disorder. (Noori et al, 2023)

Classification of Social media platforms

Social media consists of many types of networks, each of them for its specific purpose but generally serving the same purpose. Below are the classifications of social media.

1. Social networks

These social networking sites helps people to connect with each other, users are allowed to share their thoughts, to upload photos, videos, from groups based on their interests and also to be involved in a group discussion. Social networking sites are mainly used to connect with people you may or may not know. There are focused more on person-to-person conversations and knowledge-sharing. These platforms entertain different content formats, like photos, text and videos which are considered the center of communication. Examples of social networking platforms includes-Facebook, Instagram, LinkedIn, Twitter, TikTok.

2. Image-based sites

These platforms allow users to share content in the form of infographics, illustrations, and images. They offer a platform to start conversations, inspire creativity, make products seem more appealing and encourage customers to talk about a brand. Examples of image-based platforms includes- Instagram, Pinterest, Flickr, and Photobucket.

3. Video hosting platform

Video hosting platforms give independent filmmakers, journalists, and other creators a way for their audiences to stream videos quickly and easily. Examples of these platforms are YouTube, TikTok, Snapchat, Vimeo, Instagram, and Snapchat.

4. Blog and community platforms

These social media networks give you a place to publish your thoughts on your job, current events, hobbies and more. Blogging platforms are a great way to provide valuable and educational insights that could be related to your product or business. Here are some of the renowned blogging, and publishing networks-Medium, Tumblr, WordPress, and Facebook.

5. Discussion forums

Discussion forums are platforms that encourage people to answer each other's questions and share ideas and news. There are designed to spark conversations based on shared interests or curiosity. Some of the most-visited discussion forums are: Reddit, Digg, Quora, and Clubhouse.

Research Methodology

Study Area

The location of study is Kogi state polytechnic, Lokoja, Nigeria. Kogi state polytechnic is located in Lokoja, Kogi state.

Scope of study

This study was carried out amongst undergraduate students of Kogi State Polytechnic, Lokoja, Kogi State, Nigeria, consisting of males and females from the ages of 18 years and above.

Study design

A cross-sectional study design using quantitative method of data collection was used for this study.

Study population

The study population consisted of both male and female from the age of 18 years and above, schooling in Kogi State Polytechnic, Lokoja, Kogi State, Nigeria.

Sample size

The respondents for this study where a total number of 100 undergraduate students consisting of male and female of Kogi State Polytechnic, Lokoja, Kogi State, Nigeria.

Instrument for data collection

A semi-structured questionnaire was administered by the researcher to get information from respondents in the study. The questionnaire consisted of close ended questions. It consisted of thirty-six questions (36), the questions were divided into four (4) sections, (A-D)**.** Most of the questions required response with a tick [✓] in the boxes provided beside the question.

Section A consisted of seven (7) items on socio demographic characteristics of the respondents.

Section B consisted of seven (7) questions to determine when, why and how the respondents make use of social media.

Section C consisted of eighteen (18) questions to test the knowledge level of respondents on the positive and negative effects of social media. Each respondent was required to pick the correct option from question 15-32. Respondents who scored a total of 0-6 questions correctly were said to have Poor knowledge on the effects of social media, while those who scored a total of 7-12 questions correctly were said to have Fair Knowledge on the effects of social media and finally those who scored a total of 13-18 questions correctly were said to have Good Knowledge on the effects of social media.

Section D consisted of four (4) questions to determine the positive and negative effects of social media experienced by each undergraduate respondent.

Method of data analysis

Data entry and evaluation was done using Microsoft Excel. The result of this study is presented using descriptive statistics like percentages, tables, pie chart, and figures.

Materials

A practical depiction of this study was carried out, below are the materials used:

1. **Acrylic plastic board:** It is also known as acrylic glass or Perspex, it's a type of transparent plastic material that is often used as a lightweight alternative to glass.

2. **Specialty Acrylic Vinyl (SAV):** It is a 3D printing material, used in sign making, printing, and crafting.
3. **Fiber Frame:** Fiber-reinforced polymers (FRP) or fiber-reinforced composite are used in construction or sports equipment.

Research findings and Analysis of work

For the purpose of this study, a total of 100 questionnaires were distributed, properly filled and 100 responses were obtained, which represents 100% response rate. The data was used for analysis.

Socio-demographic characteristics of respondents

Result show that, 12 (12%) respondents were aged from 18 years below, followed by 20 (20%) respondents aged between 19-20 years, 18 (18%) respondents aged between 21-22, 16 (16%) respondents aged between 23-24, 17 (17%) aged from 25-26, and 17 (17%) were 27 years above.

Majority of the respondents 55 (55%) were female while the minority of the respondents were male with 45 (45%).

A total of 71 (71%) of the respondents indicated that they were Christians while 29 (29%) indicated they practice Islam.

Since respondents were picked at random, result shows a majority of 33 (33%) respondents were HND 1 students, 31 (31%) respondents were HND 2 students, 26 (26%) respondents were ND 2 students while 10 (10%) respondents were ND 1 students.

A total of 49 (49%) respondents were self-employed, 37 (37%) of respondents were unemployed while 14 (14%) respondents were employed.

Use of social media

Result from this study indicates that every respondent makes use of social media.

Result show that during weekdays (Monday-Friday), a majority of 45 (45%) respondents frequently make use of social media, 35 (35%) of respondents make use of social media all-day, 15 (15%) of respondents sometimes make use of social media while a minority of 5 (5%) of respondents rarely make use of social media.

Result show that during weekends (Saturday-Sunday), a majority of 51 (51%) respondents frequently make use of social media, 30 (30%) of respondents make use of social media all-day, 13 (13%) of respondents sometimes make use of social media while a minority of 6 (6%) of respondents rarely make use of social media.

Result show that a majority of 48 (48%) respondents make use of social media mostly in the evening, 18 (18%) of the respondents make use of social media at midnight, 16 (16%) of the respondents make use of social media all through the night, 10 (10%) of the respondents make use of social media in the afternoon while 8 (8%) of the respondents make use of social media in the morning.

Result show that 73 respondents make use of social media to get information about school, 70 respondents make use of social media for the purpose of talking to friends or chatting with friends and for research purposes while 69 respondents make use of social media to do assignments.

Result show that a majority of 35 (35%) respondents make use of social media for about 61-80% of time in a day, 30 (30%) respondents make use of social media for about 41-60% of time in a day, 22 (22%) respondents make use of social media for about 21-40% of time in a day, 7 (7%) respondents make use of social media for about 0-20% of time in a day while 6

(6%) respondents make use of social media for about 81-100% of time in a day.

Result of this study show that 82 respondents use WhatsApp, 54 respondents make use of Facebook, 52 respondents make use of TikTok.

Knowledge of the effects of social media

Result shows that after outlining questions on the knowledge of the effects of social media, a total of eighteen questions on the positive and negative effects of social media were thrown to the respondents, they were later categorized into three groups which are poor, fair and good knowledge level. Respondents who scored 0-6 points were grouped under poor knowledge level, while those who scored 7-12 points were grouped under fair knowledge, then those who had 13-18 points were grouped as good knowledge.

The study reveals that the majority 71 (71%) of the respondents had good knowledge of the positive and negative effects of social media while 29 (29%) respondents have fair knowledge of the positive and negative effects of social media.

Effects of social media on respondents

Result from the positive effects of social media usage show that social media improved learning and research of 89 (89%) respondents, social media helped 79 (79%) respondents to have quick access to school information, social media improved the communication of 71 (71%) respondents with other colleagues, 70 (70%) respondents agree that social media improved information sharing with one another while 45 (45%) respondents accepted that social media helped them to improve their grades in school.

Results from the negative effects of social media usage show that social media has reduced the amount of sleep time of 46 (46%) respondents, social media has increased the level of laziness and procrastination of 42 (42%) respondents, 38 (38%) respondents agreed that social media increased the lack of money due to regular data purchase, social media has caused eye problem which 32 (32%) respondents are experiencing due to longer screen time, 28 (28%) respondents recorded that social media has become an addiction because they cannot do without it, social media has caused poor concentration in the studies 17 (17%) respondents, 12 (12%) respondents recorded that comparing their life with other people on social media has taken away their peace, also social media has increased depression and anxiety in 11 (11%) respondents, 10 (10%) of respondents have experienced or are experiencing cyberbullying and lastly it was discovered that social media caused poor grades in 8 (8%) respondents.

Table 1
Social-demographic characteristics of respondents

Variables	Frequency (n=100)	Percentage (%)
Age(Years)		
18 and below	12	12
19-20	20	20
21-22	18	18
23-24	16	16
25-26	17	17
27 and above	17	17
Total	100	100
Sex		
Male	45	45
Female	55	55
Total	100	100
Religion		
Christianity	71	71
Islam	29	29
Total	100	100
School Level		
ND 1	10	10
ND 2	26	26
HND 1	33	33
HND 2	31	31
Total	100	100
Employment Status		
Employed	14	14
Unemployed	37	37
Self – employed	49	49
Total	100	100

Table 2
Reasons why social media is used

Reasons	Frequency(n=100)	Percentage(%)
To get information about school		
Yes	73	73
No	27	27
Total	**100**	**100**
To do assignments		
Yes	69	69
No	31	31
Total	**100**	**100**
To attend online classes		
Yes	42	42
No	58	58
Total	**100**	**100**
To talk or chat with friends		
Yes	70	70
No	30	30
Total	**100**	**100**
For business or work purposes		
Yes	59	59
No	41	41
Total	**100**	**100**
To meet new friends		
Yes	51	51
No	49	49
Total	**100**	**100**
To get fame		
Yes	28	28
No	72	72
Total	**100**	**100**
For research purposes		
Yes	70	70
No	30	30
Total	**100**	**100**
Others		
Yes	28	28
No	72	72
Total	**100**	**100**

Table 3
Knowledge of the effect of excessive social media usage

Knowledge Level	Frequency(n=100)	Percentage(%)
Poor (0 - 6)	0	0
Fair (7 - 12)	29	29
Good (13 - 18)	71	71
Total	100	**100**

Table 4
Negative Effect of social media

Effects	Frequency (n=100)	Percentage (%)
• **Poor Grades**		
Yes	8	8
No	92	92
Total	100	100
• Increased Laziness		
Yes	42	42
No	58	58
Total	100	100
• **Reduced amount of** sleeping time		
Yes	46	46
No	54	54
Total	100	100
• **Eye problem due to longer screen time**		
Yes	32	32
No	68	68
Total	100	100
• **Cyber bullying**		
Yes	10	10
No	90	90
Total	100	100
• **Increased depression and anxiety**		
Yes	11	11
No	89	89
Total	100	100
• **Lack of money**		
Yes	38	38
No	62	62
Total	100	100
• **Addiction**		
Yes	28	28
No	72	72
Total	100	100
• **Poor concentration in studies**		

Yes	17	17
No	83	83
Total	100	100
• **Taking away of peace of mind**		
Yes	12	12
No	88	88
Total	100	100

Figure 1

Fig 1 is a pie chart showing percentage of the knowledge level of respondents.
Source: Researcher' Field Work 2025

Figure 2

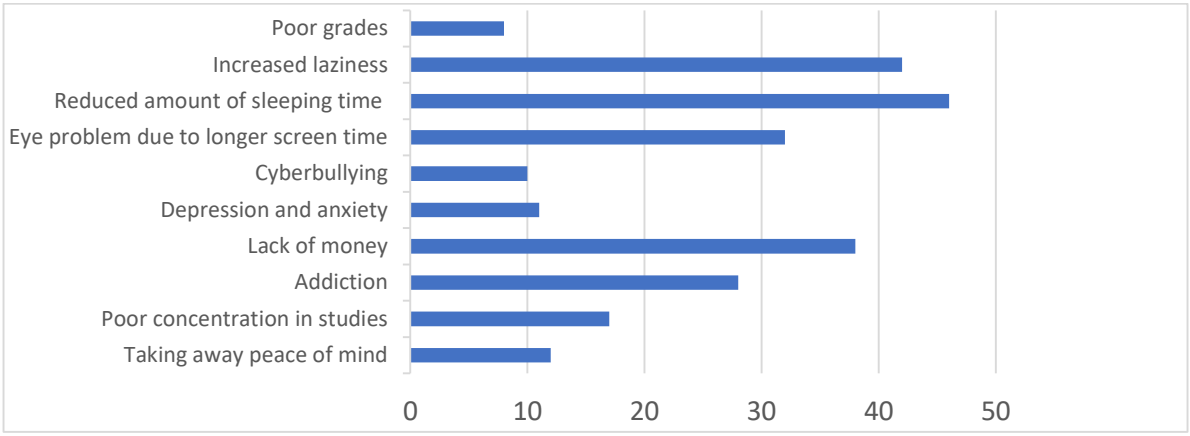

Fig 2 is a bar chart showing the negative effects of social media.

Source: Researcher' Field Work 2025

Analysis of Work

Plate 1: Preparing the Acrylic plastic board

Plate 2: Mixing of lubricant for easy placement of SAV

Source: Researcher's Field Work

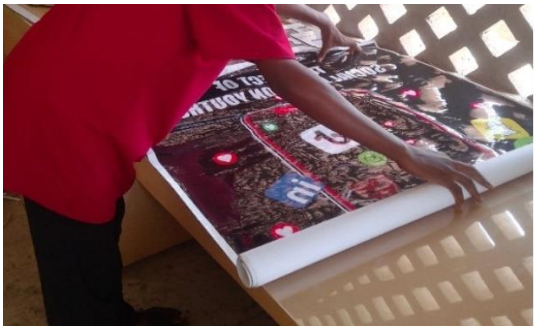

Plate 3: Placing the SAV on the acrylic board

Plate 4: SAV fully placed on the acrylic board

Source: Researcher's Field Work

Plate 5: The final work showing users in bondage

Researcher's Field Work 2025

Summary

This study helped to determine the effects of social media among undergraduate students of Kogi State Polytechnic, Lokoja, Kogi State, Nigeria. Excessive social media use can distract students from important activities and also cause academic, mental and physical issues or impact on students. This study also ascertained the knowledge level of undergraduate students of Kogi State Polytechnic, Lokoja, Kogi State. Furthermore, this study went ahead to examine how, when and why social media is used by Kogi State Polytechnic, Lokoja, Kogi State.

A total of 100 undergraduate students schooling in Kogi State Polytechnic, Lokoja, Kogi State, within the age of 18 and above were randomly selected for this study and a semi-structured questionnaire was used for data collection, with 100% response rate (100 respondents).

The outcome of this study showed that social media caused reduced sleeping time for a majority of 46 respondents, increased laziness and procrastination among 42 respondents and addiction in 28 respondents. Also, social media led to poor concentration on studies and poor grades in 28 and 8 respondents respectively.

The outcome of this study showed that 71 (71%) respondents had good knowledge on the positive and negative effects of social media usage while 29 (29%) respondents had fair knowledge on the positive and negative effects of social media.

Conclusion

This study showed that undergraduate students of Kogi State Polytechnic, Lokoja, Kogi State, Nigeria, make use of social media frequently for about fifty to sixty percent of 24hours time each day. A large number of the undergraduate students of Kogi State Polytechnic, Lokoja, make use of WhatsApp the most as well as Facebook, TikTok, Instagram etc. Furthermore, majority of the undergraduate students of Kogi State Polytechnic, Lokoja claim the reason why they make use of social media the most was to get information about school, for research purposes, to do assignments and then to talk and chat with friends.

This study established that undergraduate students of Kogi State Polytechnic, Lokoja, Kogi State, Nigeria have good knowledge on the effects of excessive usage of social media and it was discovered mainly that majority of the undergraduate students of Kogi State Polytechnic, Lokoja, Nigeria had reduced sleep time, increased laziness, increase in lack of finance and resources due to regular purchase of data, addictions and poor concentration as well as poor grades because of excessive use of social media. However, in this study is was also discovered that social media could lead to depression and anxiety, lack of peace of mind as a result of unnecessary competition and comparison and last but not the least some students experienced or are experiencing cyberbullying.

1.1 Recommendations

The following recommendation are made for this study:

1. Awareness should be created in regard to the adverse effect of the excessive use of social media through advertisement using art expressions using different medium such as paintings, drawings, posters, signposts, banners, videos, write ups, etc.
2. Education institutions should integrate efforts to tackle smartphone addiction through introducing stiff laws.
3. Education institutions should integrate efforts to tackle smartphone addiction into their curricula and prioritize addressing the risk factors.
4. Interventions targeting negative consequences of social media use should focus on addressing content consumed, rather than time spent on social media platforms.
5. There is need for further studies to figure out more negative effects of excessive social media usage among undergraduate students using other tertiary institutions as case study.

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Revolutionizing Visual Communication: Exploring the Relationship Between Printing Technology And Graphic Design In Signage Production.

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ABSTRACT

The convergence of printing technology and graphic design has transformed the signage industry, enabling the creation of visually stunning, informative, and engaging signs. This study will explore the intersection of printing technology and graphic design in signage, examining the impact of advancements in digital printing, inkjet technology (large format), and 3D graphic design principles and practices. The research will investigate how these technological innovations will expand the creative possibilities for printers and graphic designers, enabling them to produce complex, interactive, and immersive signage experiences. The study will also discuss the future directions of signage design, including sustainable signage, smart signage, and accessible signage. By examining the intersection of printing technology and graphic design, this research aims to contribute to the development of innovative signage solutions that will enhance visual communication and engage audiences.

Keywords: *signage, printing technology, graphic design, visual communication, innovation.*

INTRODUCTION

Printing technology refers to the various methods and processes used to produce printed materials, such as books, magazines, newspapers, packaging, and signage. Hurst, 2017 however refers to Printing technology as the process of reproducing text and images using a variety of techniques, including relief printing, intaglio printing, screen printing, and digital printing.

The relationship between printing technology and graphic design has transformed the signage industry, enabling the creation of visually stunning, informative, and engaging signs. This fusion has revolutionized visual communication, enhancing the way businesses, organizations, and individuals convey messages to their audiences. Hurst, 2017 opined the advent of digital technology has transformed the signage industry, enabling the creation of immersive, interactive, and engaging visual experiences. The relationship between printing technology and graphic design has given rise to new possibilities in signage design, from large-format digital prints to intricate, 3D-printed installations (Leahy, 2019). As signage continues to play an increasingly important role in visual communication, it is essential to explore the dynamic relationship between printing technology and graphic design.

The rapid evolution of printing technology has expanded the creative palette for graphic designers, allowing them to experiment with novel materials, textures, and effects (Smith, 2020). Digital printing, in particular, has revolutionized the signage industry, enabling the production of high-quality, photo-realistic images (Hurst, 2017). The integration of printing technology and graphic design has also enabled the creation of interactive signage experiences, such as augmented reality (AR) and near-field communication (NFC) enabled signs (Kim, 2018).

This study investigates the impact of technological innovations on graphic design principles and practices in signage, examining the opportunities, challenges, and future directions of this rapidly evolving field.

Statement of the Problems

The production of signage is a critical aspect of visual communication, and the relationship between printing technology and graphics design plays a significant role in determining the quality and effectiveness of signage. Despite the advancements in printing technology, several problems persist:

Limited understanding of printing technology: Many graphics designers lack a deep understanding of printing technology, leading to suboptimal design decisions and poor print quality.

Inadequate communication between designers and printers: The lack of effective communication between designers and printers can result in errors, delays, and increased costs.
Inconsistent print quality: Variations in print quality can affect the overall appearance and effectiveness of signage, leading to a negative impact on brand image and customer engagement.

Limited design options: The limitations of traditional printing technologies can restrict design options, making it challenging to create innovative and eye-catching signage.

Environmental concerns: The use of certain printing materials and technologies can have a negative impact on the environment, and designers and printers need to consider sustainable options.

Theoretical framework:

This study is grounded in the following theoretical frameworks:

1. Visual Communication Theory: This theory posits that visual elements, such as images, colour, and typography, play a crucial role in communicating messages and ideas (Barnard, 2005).
2. Design Thinking: This approach emphasizes the importance of empathy, creativity, and experimentation in developing innovative solutions (Brown, 2009).
3. Technology Acceptance Model (TAM): This model explains how users form attitudes and intentions towards using new technologies (Davis, 1989).
4. Diffusion of Innovations Theory: This theory describes how new ideas and technologies spread through a social system (Rogers, 2023).

Conceptual Framework:

The conceptual framework for this study is based on the intersection of printing technology and graphic design in signage production. The framework consists of the following components:

Figure 2.1: Graphic Illustration of the Signage
Source: Reserchers' field work

1. Printing Technology: This component includes the various printing technologies used in signage production, such as digital printing and large-format printing.
2. Graphic Design: This component includes visual communication elements, such as typography, colour, and imagery, used in signage design.
3. Signage Production: This component includes the process of designing, printing, and installing signage.
4. Visual Communication: This component includes the use of visual elements to communicate messages and ideas.

Relationships Between Components:

The relationships between the components of the conceptual framework is as follows:

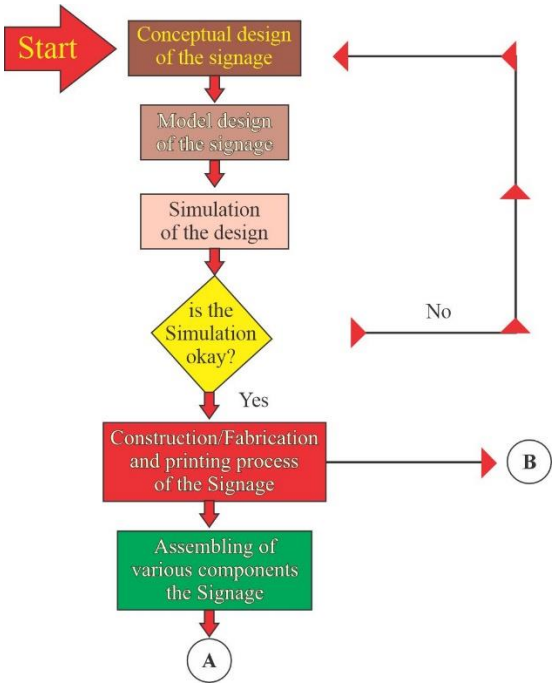
1. Printing Technology → Graphic Design: Advances in printing technology have enabled the creation of high-quality, visually appealing graphic designs.
2. Graphic Design → Signage Production: Effective graphic design is critical to the success of signage production.
3. Signage Production → Visual Communication: The ultimate goal of signage production is to communicate messages and ideas through visual elements.

Methodology

This is a set of systematic technique employed in research, it is a simple guide to research and how it is conducted. It also describes and analyses methods and shed more light on their limitation and resources (Daniel, *et al,* 2023). It therefore describes the path through which the researchers conduct their research, the path through which he formulates his problem and objective and present his result from the data obtained during the period. In order to achieve the stated objectives of the research, a framework was developed to depict the flow of

activities. A conceptual design was done followed by design analysis. Also, to ascertain that the design was adequate before fabrication, a simulation study was done. A conceptual design flow chart for the research methodology is presented in Fig. 2.2.

Figure 2.2: Design Methodology Flowchart for the development of printer



**Source: Researchers' field work (2025)*

Design Consideration

The materials and methods adopted in this research were appropriated in consideration of the following: availability of materials, properties of the materials selected such as rigidity, corrosion and wear resistance, hygiene of fabrication and overall weight of the signage and cost of fabrication in order to produce an efficient and reliable Signage that will ensure the techno-economic status.

Research Design

This can be seen as the overall strategy chosen to put together different components of the scholar work in a coherent and logical way, ensuring effectiveness in addressing the research problem; constituting the blueprint for the collection, measurement and analysis of data (De' Vaus, 2006). Therefore, the researchers' answered the research questions by measuring each research objective to find out whether or not the objectives set out for the research were addressed. This type of design is a constructive research design which means that it develops solution to a problem that has to be solved through the development of a system. Understanding that the potential application field of constructive research is broad, it has provoked positive attention among business administration and engineering researchers' (Vaso, 1998 in Lukka, 2003). The constructive research approach is a research procedure meant to produce innovative construction that is intended to solve problems faced in the real world. The central notion of this approach, the construction is an abstract notion with great and infinite number of potential realisations. All human artefacts such as models, diagrams, plans, organisation structures, commercial products and information system designs are constructions. It is characteristic of them that they are invented and developed, and not discovered (Lukka, 2003).

One of the core features of the constructive research approach is that it produces an innovative construction meant to solve the initial real-world problem and dovetail into an attempt for implementing the developed construction and thereby test its practical applicability (Lukka, 2000). As this often relate to ideas, and also to tangible artefacts as in the case of the current study where a fabricated signage is developed to address real life problem. Figs. 2.2 shows the procedure in designing and Fabricating the Signage. Adequate research of materials to back up the design was likewise done. Choosing the right Alco-board, Foam Board, Screws, Metal and SAV, and others were accomplished.

Procedure for Development of the Signage.

This refers to the development process of the design, construction and fabrication of the signage. Starting from the researchers' conceptual design shown in Figs. 2.2 which led to the simulation of the work to see how the components fit before the actual fabrication was carried out. The Procedure for the Production of the Signage are divided into two; The Design Process and The Development Process:

The Design Processes (Stage A)

This stage involves representing the concept of the signage on paper via system designs, and imputed and modified with the aid of computer software application. However, it is important to state the minimum computer system requirement that can run the graphic application software used for the design process. Corel Draw was used to systematically design the conceptualized signage for ease of fabrication and coupling.

Computer System Requirement

The minimum Computer System Specification to carry out the design is as follows:

Corel Draw Application

Operating System: Apple® macOS™ Big Sur 11.0*; Catalina 10.15; Mojave v10.14; High Sierra v10.13 Microsoft Windows 10 (64-bit)

CPU Type: x86-based 64-bit processor (e.g., Intel Core i, AMD Ryzen series), 4 cores, 1.7 GHz or greater; 32-bit not supported ARM-based processors partially supported via Rosetta 2 only

Memory:4 GB of RAM (integrated graphics recommend 6 GB or more)

Graphcs Card: Supported for DirectX 11 or greater Dedicated GPU with 1 GB or more of VRAM Integrated graphics with 6 GB or more of RAM

Disk Space: 3 GB of storage

Display Resolution: 1366 x 768 (1920 x 1080 or greater at 100% scale strongly recommended)

Pointing Device: HID-compliant mouse or trackpad, optional Wacom® tablet and 3Dconnexion Space Mouse® support

Internet: 2.5 Mbps or faster download; 500 Kbps or faster upload

Dependencies: .NET Framework 4.5, SSL 3.0, TLS 1.2+

Step-By-Step Design Process/Procedure

Gather all necessary data and information needed for the design of the system: At this stage of the work, the researchers' brought together all the design data needed for the fabrication work from their sketches to the computer application drawings and followed them step by step to complete the set objective.

The Construction/Fabrication Process

Rogers, 2023 states that the Construction/Fabrication of an innovation is the process of putting together a new idea in a form that is expected to meet the need of an expected audience or potential adopters. Construction/Fabrication process however represents a transformation of an invention into a form that will be more acceptable to potential adopters. Design development process is a fundamental part of Industrial Design and this research is an example of the effective utilization of design development process. Starting from problem statement and the requirement for building a fully functional product, every single step of the design development process has played a vital role in the success of this research. Construction/Fabrication of Printing Technology Department from the scratch is not an easy one. There are various aspects which require meticulous study, care was taken to

understand the problems involved in the research and finding solutions to them. Every detail has been addressed skilfully and sensitively.

The main processes involved in Construction/Fabrication of Printing Technology Department have been described and they are: Designing the signage, Construction/Fabrication of the Letters, Printing of the SAV Background, Mounting the printed SAV on an Alco Board sheet, Assembling of the Constructed/Fabricated Letters on the prepared background, preparing and mounting on a metal frame. The materials for Constructing/Fabricating various parts were selected considering the factors such as weight, forces, turning and the like.

The Development (Construction/Fabrication) Process (Stage B)

Step by step Approach

Plate 2.1: Gluing the stencil of the signage to Alco-Board for easy cutting

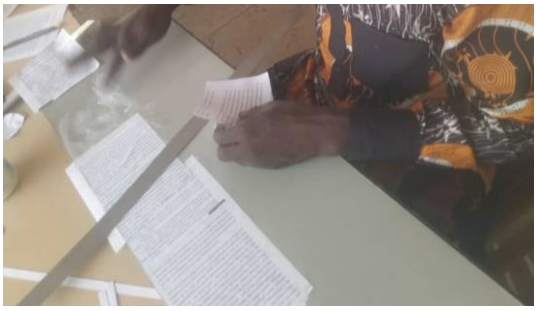


Plate 2.2: Cutting of the letters for the Signage

Source: Researchers' field work (2025)

Plate 2.3: Pictures of the letters constructed for the Signage

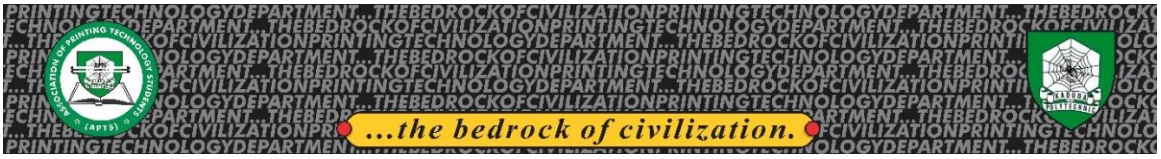
Plate 2.4: Measuring and Cutting Foam Board for letter Fabrication

Plate 2.5: Fabrication of Letters using Foam Board for the Signage

Plate 2.6: Fabricated Letters for the Signage

Source: Researchers' field work (2025)

Plate 2.7: Printed Background for the Signage



Source: Researchers' field work (2025)

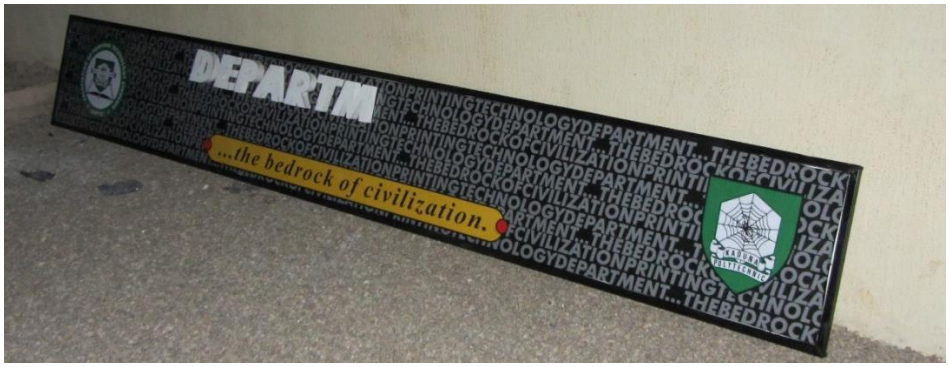
a. Fabrication and Evaluation

Major materials for the development of signage were locally sourced, other materials that were not readily available such as the Letters were fabricated using locally sourced raw materials as shown in Plate. 2.1 to 2.7. The Printing Technology Department Signage was successful as shown in Plate. 2.8. This makes the fabrication and evaluation a successful one having fulfilled the aim and objective of the research.

Plate 2.8 Fabricated Letters Arrangement to Check the Balancing

Source: Researchers' field work (2025)

Plate 2.9: Assembling of the Fabricated Letters on the prepared Background



Source: The Researchers' field work (2025)

Plate 2.10: The Printing Technology Department Signage

Source: The Researchers' field work (2025)

b. Checking and Presentation

Checking is a way of measuring the knowledge, skills and the feelings about the intellectual work, while the presentation is a way of demonstrating the functionalities of the signage.

Summary

The study was carried out and the following were determined by the researchers' and executed: exploring the relationship between printing technology and graphic design in signage production, examining how advances in printing technology have influenced graphic design principles and practices in the creation of effective signage solutions.

Five Specific Objectives were set for the study, as well as five corresponding Research Questions. The Specific Objectives were achieved, likewise the research questions.

Chapter two generally captures the theoretical frame work and related empirical studies. This frame work highlighted Summary of the relationship between printing technology and graphic design in signage production.

Conclusion

The traditional method of designing a signage before now was to either use SAV, Flex paint on wood or metal, but combining SAV and 3D graphic is rarely being explore. The foregoing were the challenges that prompted the researchers to design, construct and fabricate the Printing Technology Department Signage. The design and construction and fabrication of letters were achieved through the application of necessary design principles and fabrication techniques. The researchers were able to fabricate the signage by adhering to design as illustrated in the computer design. The intersection of printing technology and graphic design in signage production has been achieved with the signage fabrication. Unlike the existing signages, the Signage was successfully carried

out by combining printing and 3D graphic fabrication in one signage.

Furthermore, the regular process of painting signage background has being eliminated through the SAV background method.

Recommendation

Improvements on the design can be applied to further enhance its capabilities and functionalities, such as introducing a sensor that will automatically change background. Having the sensor will make the signage to be automated and no longer require the user to undergo the manual stress of printing or changing background.

The synergy between printing technology and graphic design has therefore being revolutionized visual communication in signage. As innovations continue to emerge, signage is becoming increasingly sophisticated, engaging, and effective in conveying messages to diverse audiences.

Contribution to Knowledge

The study has contributed to the body of knowledge as it has successfully designed and fabricated a signage that combines printing technology and graphic design. This is novel development and also economically viable.

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The Prevalence of the Use of Potassium Bromate in Bread Sold in Lokoja Metropolis

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Abstract

Potassium bromate is a flour improver banned in Nigeria and many other countries due to its carcinogenic and nephrotoxic effects. Despite these restrictions, there is growing evidence that the compound is still used in bread production. Twenty bread samples were collected from supermarkets, open markets, and bakeries in Lokoja metropolis. Qualitative analysis was performed using alcoholic potassium iodide and hydrochloric acid. Colorimetric changes (purple coloration) were graded as trace (+), low (++), medium (+++), high (++++) and very high (+++++). All 20 bread samples tested positive for potassium bromate. The concentration distribution was as follows: 2 samples (10%) trace, 8 samples (40%) low, 6 samples (30%) medium, 2 samples (10%) high, and 2 samples (10%) very high. This indicates widespread non-compliance with existing food safety regulations. The persistence of potassium bromate in bread sold in Lokoja presents a serious public health concern. Stronger regulatory enforcement, targeted awareness campaigns, and the promotion of safer alternatives such as ascorbic acid and enzyme-based improvers are recommended. Future studies should employ quantitative techniques and toxicological risk assessment to better evaluate exposure risks.

Keywords: Potassium bromate, Bread safety, Lokoja metropolis, Food additives, Public health

Introduction

Bread is one of the most widely consumed staple foods globally and remains an important part of the human diet because it is affordable, accessible, and convenient. In Nigeria, bread is eaten daily by people across all socio-economic groups, making it a significant source of energy and nutrients (Okoye et al., 2021). To meet increasing demand, many bakeries employ chemical additives to improve bread quality, appearance, and shelf life.

One such additive is **potassium bromate**, which acts as an oxidizing agent, strengthening gluten networks, improving gas retention, and producing bread with larger volume and softer texture (Adejumo & Ojo, 2020). While these properties are attractive to bakers, potassium bromate is also classified by the International Agency for Research on Cancer (IARC) as a possible human carcinogen (Group 2B) (WHO, 2019). Studies have linked its intake to cancers of the kidney, thyroid, and gastrointestinal tract, as well as oxidative stress and nephrotoxicity (Oloyede et al., 2020a).

Because of these risks, the compound has been banned in many countries, including Nigeria, where agencies such as the National Agency for Food and Drug Administration and Control (NAFDAC) and the Standards Organisation of Nigeria (SON) prohibit its use in bread and baked products (NAFDAC, 2020). Nevertheless, its continued use has been reported in Nigerian bakeries, largely due to cost-effectiveness and higher efficiency compared with safer alternatives such as ascorbic acid (Umar & Ibrahim, 2021).

This study therefore aimed to assess the prevalence of potassium bromate in bread sold in Lokoja metropolis. The findings provide evidence that may guide regulatory enforcement and consumer awareness initiatives.

Materials and Methods

Sample collection:

Twenty (20) bread samples were collected randomly from open markets, supermarkets, and provision stores across Lokoja metropolis, Kogi State. Three samples originated from bakeries in Abuja (FCT), one from Ibadan, and seventeen from Lokoja. Lokoja lies at Latitude 7.79688° N, Longitude 6.674048° E, and an altitude of 53 meters above sea level.

Qualitative analysis:

Approximately 5 g of each bread sample was weighed and placed in a boiling tube. Each was moistened with 5 mL distilled water, followed by 5 mL of 5% potassium iodide (KI) solution in 0.1 mL hydrochloric acid (HCl). The presence of potassium bromate ($KBrO_3$) was confirmed by the appearance of a purple coloration, the intensity of which was graded as:

- = Trace
  ++ = Low
  +++ = Medium
  ++++ = High
  +++++ = Very High

Note: This study employed **only qualitative colorimetric analysis**. It is therefore presented as a **preliminary screening** of potassium bromate presence, not a quantitative assessment.

Results

Table 1. Presence of potassium bromate in bread sold in Lokoja

S/N	Sample	Location of bakery	Presence of $KBrO_3$
1	A	Abuja	+++++
2	B	Abuja	++
3	C	Abuja	++
4	D	Ibadan	++
5	E	Lokoja	++
6	F	Lokoja	+++
7	G	Lokoja	+++
8	H	Lokoja	+++++
9	I	Lokoja	+++
10	J	Lokoja	++
11	K	Lokoja	++
12	L	Lokoja	+++
13	M	Lokoja	+++
14	N	Lokoja	++
15	O	Lokoja	+++
16	P	Lokoja	+
17	Q	Lokoja	++++
18	R	Lokoja	+
19	S	Lokoja	++
20	T	Lokoja	++

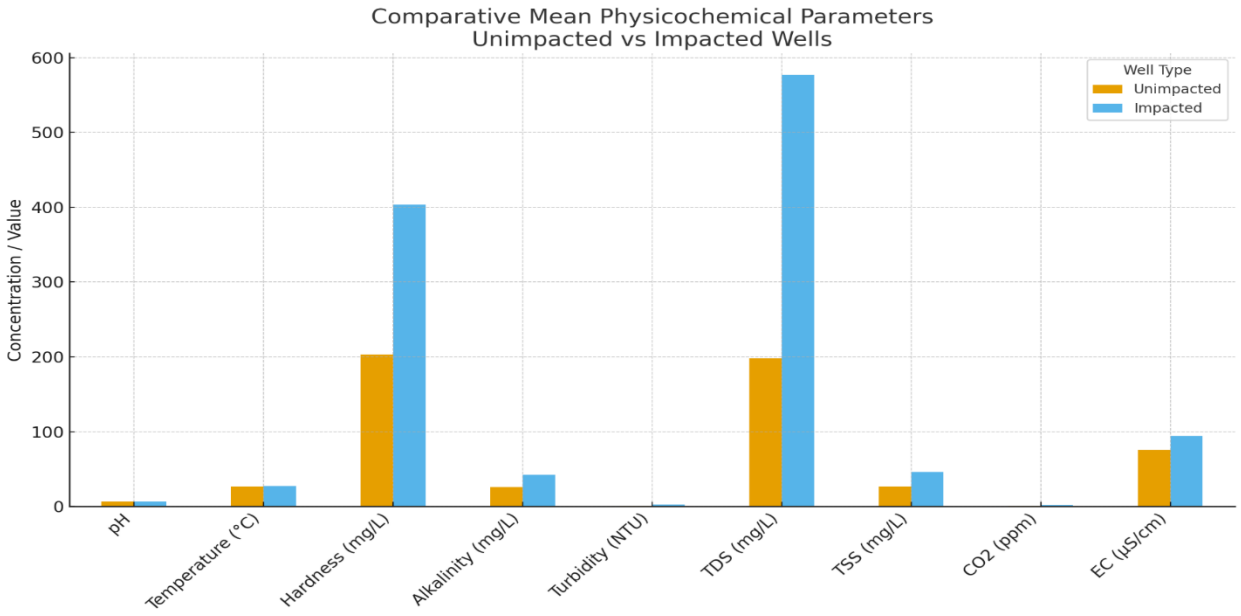

Fig 1.0 Comparative mean physicochemical parameters of unimpacted vs impacted wells

Statistical summary:

- Trace: 2 samples (10%)
- Low: 8 samples (40%)
- Medium: 6 samples (30%)
- High: 2 samples (10%)
- Very high: 2 samples (10%)

All samples tested positive for potassium bromate.

Discussion

This study revealed a **100% prevalence** of potassium bromate in bread sold in Lokoja metropolis. Although concentration levels varied, the universal presence of the additive highlights a **trend of non-compliance** with established food safety regulations.

Similar patterns have been reported in other Nigerian cities. Akinola and Oladipo (2021) observed potassium bromate in more than 80% of bread samples in Ibadan, while Nwogu et al. (2019) found comparable results in Enugu. Musa and Bello (2021) reported similar findings in Kaduna. Together, these reports suggest that the persistence of potassium bromate is not limited to Lokoja but reflects a broader national challenge.

Bread is a staple food eaten daily in Nigeria, and even trace amounts of potassium bromate can accumulate in the body over time, increasing the risk of cancer, thyroid dysfunction, and kidney damage (Adepoju et al., 2020). Internationally, the compound has been banned due to its carcinogenic classification by the IARC and WHO (WHO, 2022).

The results of this preliminary study underscore the urgent need for effective enforcement of

NAFDAC's ban. They also highlight the importance of public education on the dangers of potassium bromate and the promotion of safer alternatives such as ascorbic acid and enzyme-based improvers.

Conclusion

This study demonstrated that potassium bromate remains widely used in bread sold in Lokoja, with all samples testing positive. The findings confirm that bakery practices continue to disregard food safety standards, posing serious health risks.

For policy and practice, there is a need for:

1. Stronger regulatory monitoring and penalties for non-compliance.
2. Public awareness campaigns targeting both bakers and consumers.
3. Adoption of safer flour improvers.
4. Future research using **quantitative methods** (e.g., spectrophotometry, chromatography) and toxicological risk assessments to better evaluate consumer exposure.

These results carry implications not only for Nigeria but also for other developing countries grappling with food safety enforcement challenges.

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Comparative Analysis of the Physicochemical Parameters of Water from Open Wells Impacted by and Unimpacted by River Niger Floodwaters

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Abstract

This study evaluated the physicochemical quality of water from open wells impacted and unimpacted by floodwaters from the River Niger in Lokoja, Kogi State, Nigeria. Twelve wells were sampled: six located within flood-affected areas and six situated outside the flood zone. Parameters including pH, temperature, odour, colour, appearance, total hardness, alkalinity, turbidity, taste, total dissolved solids (TDS), total suspended solids (TSS), carbon dioxide (CO_2), and electrical conductivity (EC) were analyzed using standard procedures. Results showed that unimpacted wells generally complied with World Health Organization (WHO) standards, although total hardness (125–300 mg/L) and TSS (18–33 mg/L) occasionally exceeded desirable limits. Impacted wells exhibited pronounced deterioration, with objectionable odour, greenish coloration, turbidity, unpleasant taste, elevated hardness (140–660 mg/L), high TDS (350–850 mg/L), and elevated TSS (33–60 mg/L). These findings indicate that floodwater intrusion significantly compromises well water quality, rendering it unfit for direct human consumption. The study recommends protective well construction, routine water quality monitoring, community sensitization, and provision of alternative potable water sources during flooding to safeguard public health.

Keywords: Physicochemical parameters, River Niger, open wells, groundwater quality, flood water contamination

Introduction

Water is one of the most essential resources for sustaining life, and its quality directly influences public health, environmental balance, and socio-economic development. However, increasing urbanization, agricultural activity, and industrialization continue to pressure freshwater resources, leading to contamination and degradation (Nnaji et al., 2021). In Nigeria, open wells are a major source of domestic water, particularly in peri-urban and rural settings where treated piped water is scarce. Their shallow depth and poor protection make them highly susceptible to contamination, especially during seasonal floods (Ezeh et al., 2020).

The River Niger, one of Africa's largest rivers, plays a vital role in supporting local livelihoods. While seasonal flooding replenishes soils for agriculture, it also facilitates the intrusion of contaminated floodwater into shallow wells. This intrusion introduces suspended solids, organic matter, dissolved ions, and microbial contaminants, all of which compromise water safety (Okoye et al., 2022; Olalekan et al., 2021).

Assessing the impact of floodwaters on groundwater is essential for communities dependent on open wells. By comparing physicochemical parameters such as pH, turbidity, hardness, TDS, and alkalinity between impacted and unimpacted wells, this study evaluates the extent of water quality deterioration and its implications for public health in flood-prone areas of Lokoja, Nigeria.

Materials and Methods

Study Area and Sampling

Twelve open wells were sampled in November 2022 in Ganaja, Lokoja, Kogi State (Lat 7°42′N–7°45′N; Long 6°42′E–6°45′E). Six wells located within 100 m of the River Niger and affected by recent flooding were designated as impacted wells (A1–F1), while six wells beyond the flood zone were designated unimpacted wells (A–F). Samples were collected in one-liter polyethylene bottles, transported under refrigeration, and analyzed within 24 hours.

Physicochemical Analysis

Parameters were determined according to APHA (2017) standard methods.

- **pH, Temperature, Turbidity, TDS, EC**: measured using calibrated meters.
- **Hardness and Alkalinity**: determined by titration.
- **Dissolved Oxygen (DO) and CO_2**: Winkler's method and titration, respectively.
- **Colour, Odour, Taste, Appearance**: assessed by physical examination in line with WHO standards.

Results

Table 1: The Physiochemical properties of waters from unimpacted open wells by River Niger flood water.

S/N	Parameters/Units	Samples					
		A	**B**	**C**	**D**	**E**	**F**
1.	pH	7.60	7.10	6.02	6.81	6.98	7.02
2.	Temperature (˚c)	27.00	27.50	26.70	26.60	27.50	26.90
3.	Odour	Odourless	→	→	→	→	→
4.	Colour (TCU)	Colourless	→	→	→	→	→
5.	Appearance	Clear	→	→	→	→	→
6.	Total Hardness ($CaCO_3$ mg/L)	300	280	170	183	160	125
7.	Alkalinity (mg/L)	31.10	20.00	19.60	26.80	23.40	37.00
8.	Turbidity (NTU)	0.50	0.80	0.60	1.20	1.10	0.40
9.	Taste	Tasteless	→	→	→	→	→
10.	Total dissolved solid (mg/L)	250	230	180	164	179	186
11.	Total Suspended (mg/L)	28	33	18	29	21	32
12.	CO_2 (ppm)	0.60	0.20	0.10	0.30	1.40	0.80
13.	Electric Conductivity (s/m)	96	38	112	78	52	80

Table 2: The Physiochemical properties of waters from impacted open wells by River Niger flood water.

		Samples					
S/N	**Parameters/Units**	**A_1**	**B_1**	**C_1**	**D_1**	**E_1**	**F_1**
1.	pH	7.16	7.00	7.02	6.83	6.98	7.10
2.	Temperature (˚c)	27.00	27.10	27.10	27.10	27.40	27.70
3.	Odour	Objectionable	→	→	→	→	→
4.	Colour (TCU)	Greenish	→	→	→	→	→
5.	Appearance	Unclear	→	→	→	→	→
6.	Total Hardness ($CaCO_3$ mg/L)	400	660	140	500	300	420
7.	Alkalinity (mg/L)	47.50	19.50	21.50	29.00	64.50	74.00
8.	Turbidity (NTU)	4.00	3.60	2.80	1.20	3.00	1.00
9.	Taste	Salty	Irritating	Salty	Weird	Salty	Irritating
10.	Total dissolved solid (mg/L)	350	480	630	500	650	850
11.	Total Suspended (mg/L)	50	60	58	33	36	40
12.	CO_2 (ppm)	1.60	2.20	1.80	2.00	2.10	2.20
13.	Electric Conductivity(s/m)	110	102	96	84	76	98

Table 3: Standard Values for Potable Water

S/N	Parameters / Units	Standard Values	Organisation
1	pH	6.5 – 8.5	WHO
2	Temperature (˚C)	< 30	WHO
3	Odour	Acceptable / Unobjectionable	WHO
4	Colour (TCU)	≤ 15	WHO
5	Appearance	Clear, free from suspended matter	WHO
6	Total Hardness ($CaCO_3$ mg/L)	≤ 150 (desirable), 500 (maximum)	WHO
7	Alkalinity (mg/L)	100 – 200	WHO
8	Turbidity (NTU)	≤ 5	WHO
9	Taste	Acceptable / Pleasant	WHO
10	Total Dissolved Solids (mg/L)	≤ 500 (desirable), 1500 (maximum)	WHO
11	Total Suspended Solids (mg/L)	≤ 10	WHO
12	CO_2 (ppm)	≤ 10	WHO
13	Electrical Conductivity (µS/cm)	≤ 1000	WHO

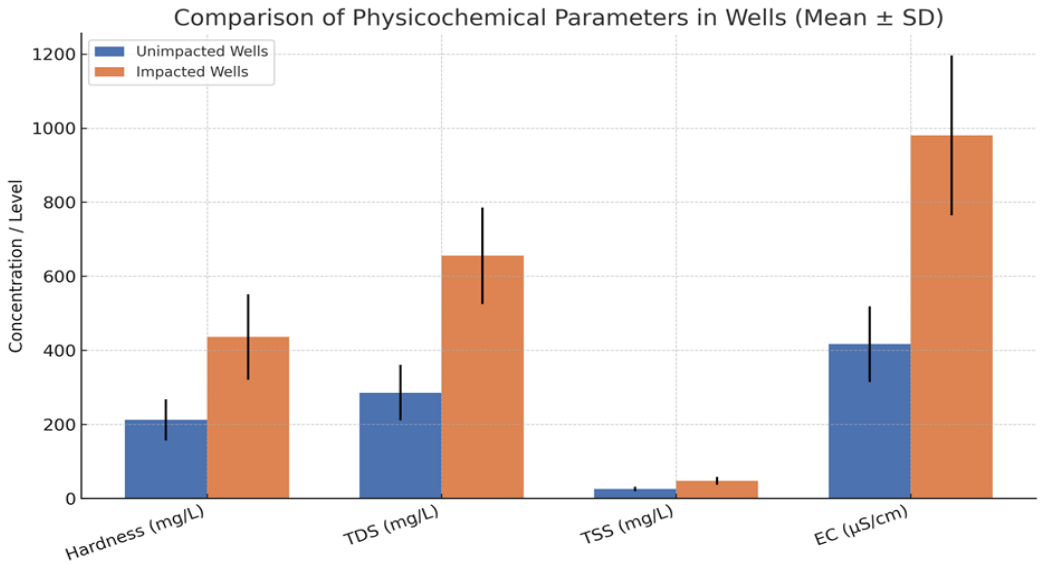

Fig 1.Comparison of physicochemical parameters in wells (Mean ± SD)

Discussion

The analysis revealed that floodwater intrusion significantly altered the physicochemical quality of open well water. While pH and temperature values across both groups conformed to WHO standards, organoleptic properties clearly distinguished the categories. Impacted wells had objectionable odour, greenish coloration, and cloudy appearance, consistent with reports by Olalekan et al. (2021) on flood-prone aquifers.

Hardness levels in unimpacted wells (125–300 mg/L) occasionally exceeded the desirable 150 mg/L but remained below the 500 mg/L maximum. Impacted wells, however, exhibited much higher hardness (up to 660 mg/L), posing risks of scaling and poor palatability (Nnaji et al., 2021). Similarly, TDS values for unimpacted wells (164–250 mg/L) were well within safe limits, while impacted wells showed elevated levels (350–850 mg/L), reflecting mineralization and ion contamination from floodwaters (Okoye et al., 2022).

Turbidity and TSS exceeded WHO standards across all samples, though more pronounced in impacted wells (up to 60 mg/L). This suggests heightened microbial risk and reduced potability. These findings corroborate earlier studies (Akinbile et al., 2020; Ezeh et al., 2020).

Overall, unimpacted wells met most WHO guidelines, while impacted wells displayed multiple deviations that render them unsafe without treatment.

Conclusion

Floodwater intrusion into open wells along the River Niger markedly compromises groundwater quality, particularly with respect to hardness, turbidity, TSS, TDS, and organoleptic characteristics. Although unimpacted wells generally met WHO standards, some parameters exceeded desirable limits. Communities in flood-prone areas remain highly vulnerable to waterborne diseases due to reliance on unprotected wells.

Mitigation measures should include well protection (lining, sealing, and covers), regular water quality monitoring, public sensitization on safe water practices, and provision of alternative potable water sources during flooding. Treating impacted water before use through boiling, filtration, or disinfection is strongly recommended.

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