THE INSTITUTE OF CHARTERED ACCOUNTANTS OF NIGERIA

(Established by Act of Parliament No. 15 of 1965)

10TH ANNUAL INTERNATIONAL ACADEMIC CONFERENCE ON ACCOUNTING AND FINANCE

CONFERENCE PROCEEDINGS

NATIONAL ANTHEM

Nigeria, we hail thee,
Our own dear native land,
Though tribe and tongue may differ,
In brotherhood we stand
Nigerians all,
And proud to serve our sovereign
Motherland.

Our flag shall be a symbol
That truth and justice reign,
In peace or battle honoured,
And this we count as gain,
To hand on to our children
A banner without stain.

O God of all creation,
Grant this our one request:
Help us to build a nation
Where no man is oppressed,
And so with peace and plenty
Nigeria may be blessed.

ICAN ANTHEM

Bless God ICAN fount of treasure
In triumph her banner raise
Standing stronger in harmony
Building our land together
Dreams of our founding fathers
We are striving to attain
Accounting values that we share
Through all ages be sustained

Chorus:
Institute of Chartered Accountants
of Nigeria
Noble ICAN, noble ICAN
Your accuracy we cherish
We uphold your integrity

OPENING REMARKS OF THE CHAIRMAN, CONFERENCE ORGANISING COMMITTEE OF THE INTERNATIONAL ANNUAL ACADEMIC CONFERENCE ON ACCOUNTING AND FINANCE (ACAF)

Protocols

I am highly privileged to stand before this Revered Audience of Skilled professionals and Erudite Scholars to deliver my remarks as the Chairman of the 10th Annual International Academic Conference on Accounting and Finance (ACAF) held in collaboration with the Federal University Lokoja, Kogi State. This milestone event reflects our Great Institute's commitment to advancing the frontier of knowledge and practice in the fields of accounting and finance.

On behalf of the Academic Conference Sub-committee, I thank the Vice Chancellor, Federal University Lokoja, Prof. Olayemi Akinwunmi, and the entire University Community for their collaboration on this eminent Conference and for their commendable efforts in ensuring that this tenth edition of ACAF sets a more exceptional standard for future editions of the Conference.

Please permit me to use this significant moment to express our gratitude to the Diamond President of our Great Institute, The Institute of Chartered Accountants of Nigeria (ICAN), and the Governing Council for having so much faith in us and entrusting us with the responsibility of organising this special and significant decade edition of the International Academic Conference on Accounting and Finance (ACAF). I also appreciate the Chairman, Research Committee, Hajia Queensley S. Seghosime, mni, FCA, throughout the process of planning for this Conference.

I would like to express my sincere appreciation to the members of the Conference Organising Committee for their hard work and dedication. Your efforts have made this event possible, and I am truly grateful for your commitment to excellence. I also express our unreserved gratitude to the Local organising Committee (LOC) under the leadership of Prof. Emmanuel Onoja, FCA for their relentless commitment to ensuring a hitch free Conference.

I am thrilled to have an impressive lineup of speakers and presenters, which includes our Lead Paper Presenter, Prof. Onafowokan O. Oluyombo, Ph.D., ACTI, FCA, and Guest Speaker, Dr. Temitope O. Fagbemi, FHCA, CMBE, FAIA, FCA, who will share their insights and experiences over the next few days. Their contributions to the body of knowledge are invaluable and will inspire us to push the boundaries of what we can achieve together. I equally thank all our guests and representatives from other tertiary Institutions of learning joining this Conference either physically or virtually.

I encourage all participants to engage actively in discussions, network with peers, and take full advantage of the opportunities this gathering presents to think creatively and strategically about the future of accounting and finance.

As I conclude, I want to appreciate everyone for your time and participation in this Conference, I wish you all an engaging and productive time.

Prof. Olubunmi Florence Osemene, FCA
Chairman, 10th ACAF Subcommittee

ADDRESS OF THE CHAIRMAN, RESEARCH COMMITTEE, HAJIA QUEENSLEY S. SEGHOSIME, mni, FCA AT THE 10TH INTERNATIONAL ANNUAL ACADEMIC CONFERENCE ON ACCOUNTING AND FINANCE

Protocols

I welcome our esteemed Guests, erudite Scholars, distinguished Professionals, and all delegates to the auspicious event of the 10th edition of the Annual International Academic Conference on Accounting and Finance of The Institute of Chartered Accountants of Nigeria (ICAN), holding in collaboration with Federal University Lokoja. I extend the warm regards of the Research Committee to you all and appreciate you for being part of this Scholarly event.

I would like to extend our heartfelt appreciation to Prof. Olayemi Akinwunmi, the Vice Chancellor, and the dedicated team at the Federal University Lokoja, for their remarkable openness and commitment to supporting academic and professional growth by accepting to collaborate with ICAN for this Conference.

This annual Conference serves as a vital link between academia and practice, providing a unique platform for networking and collaboration between the realms of accounting education and professional practice. This edition will feature sub-themes such as AI-driven climate change, accounting, and sustainability reporting, AI-driven ESG data analytics and sustainability, corporate ESG reporting and AI adoption, and AI-driven audit and assurance for sustainability, among other relevant topics. I want our esteemed guests and delegates to be assured of an enriching and dynamic intellectual exchange at this Conference.

A key highlight of ACAF is the Ph.D. Colloquium, introduced to provide an essential platform for emerging scholars to engage with experienced researchers, peers, and industry practitioners. The Colloquium enhances networking opportunities, allowing Ph.D. students to gain critical insights and constructive feedback that will shape their academic and professional trajectories. Ph.D. candidates will present their research proposals to Conference delegates, with assessments based on criteria including research clarity, creativity, and coherence, among other factors. Review of submissions at the Colloquium has demonstrated a significant improvement in the quality of student Ph.D. theses. To further encourage academic excellence, the Institute has also established a financial reward for the best paper presented at the Colloquium.

Ladies and Gentlemen, I want to assure you all that the Institute has put proper measures in place to give all our Guests and delegates a rewarding time at this Conference. We want to ensure that we provide a conducive environment for the fertilization of innovative and distinct ideas.

Let me also apprise you that the Research Committee is saddled with the responsibility of identifying vital research areas in accounting and promoting crucial linkages between academic research projects and technical expertise, thereby driving knowledge advancement and innovation.

As I conclude, I want to express our immense gratitude to our Lead Paper Presenter, **Prof. Onafowokan O. Oluyombo, Ph.D, ACTI, FCA**, for accepting to deliver the lead Paper on the theme of this Conference:

Gen AI-Sustainability Nexus: Charting New Paths in Accounting for a Greener Economy. I also appreciate our Guest Speaker, Dr Temitope O. Fagbemi, FHCA, CMBE, FAIA, FCA, for doing us this special honour.

I thank the Chairman and members of the Academic Conference subcommittee of the Institute, under the distinguished leadership of Prof. Olubunmi Osemene, FCA. We acknowledge your efforts and relentless hardwork towards ensuring the successful fruition of this Conference. We also commend the efforts of the Local Organising Committee under the leadership of Prof. Emmanuel Onoja, FCA. Thank you for your efforts.

Once again, I welcome all our guests and delegates, to this Conference, and I wish you an impactful time at the 10th ACAF.

Thank you all for your kind attention.

Hajia Queensley Seghosime
1st Deputy Vice President & Chairman, Research Committee, ICAN

WELCOME ADDRESS BY THE 60TH PRESIDENT, ICAN, CHIEF DAVIDSON CHIZUOKE S. ALARIBE, FCA AT THE 10TH ANNUAL INTERNATIONAL ACADEMIC CONFERENCE ON ACCOUNTING AND FINANCE

Protocols

I am honoured to welcome you to the 10th Annual International Academic Conference on Accounting and Finance organised by The Institute of Chartered Accountants of Nigeria (ICAN) in collaboration with the Federal University Lokoja. This annual scholarly event presents a platform for us at the Institute to fulfil our mandate of ensuring best practices in accounting by bringing Accounting and Finance Scholars together with our colleagues in Practice to link theory and practice and keep us abreast of the latest and global standards. Like past editions, this 10th Academic Conference on Accounting and Finance is a hybrid event. I specially acknowledge every delegate joining us physically or virtually from across the globe.

I am delighted that the 10th ACAF does not fall short of the towering standard of the past nine conference editions. As in previous years, we are privileged to host a distinguished panel of scholars who will present insightful papers and provide valuable critiques across the conference's sub-themes. May I also reiterate that this brilliant initiative of the Institute also provides mentorship for budding academics desirous of conducting internationally recognised research. Indeed, the conference has held the high repute of a hand-holding experience that continues to contribute to deepening the quality of research in accounting, finance, and other allied professions.

As a trailblazing Professional Accountancy Organisation, we recognise that the integration of accounting theory and practice is essential to ensure accounting remains a dynamic and evolving field, capable of meeting the demands of a complex and ever-changing global financial landscape. Therefore, platforms such as this are imperative, bringing together industry practitioners and academics to find permanent solutions to the numerous challenges confronting both the global accounting landscape and the Nigerian economy.

Hence, beyond this Conference being a veritable publication channel for academics, it is equally an indirect way of contributing to the national desire for inclusive growth and development.

This year, our chosen theme, **"Gen AI-Sustainability Nexus: Charting New Paths in Accounting for a Greener Economy,"** highlights the critical role that Generative AI technologies can play in fostering sustainable practices within our industry. As we come together to explore these opportunities, we acknowledge that our profession stands at the forefront of driving change and promoting a more sustainable future.

Ladies and gentlemen, dear participants, as we are aware, the United Nations, through the United Nations Environment Programme (UNEP), has been advocating for the green economy. This presents a pathway to a more sustainable and prosperous future for all by addressing climate change through reducing greenhouse gas emissions and mitigating its impacts. Furthermore, it ensures environmental sustainability by transitioning away from the current economic model that depletes natural resources and damages

ecosystems, thus safeguarding these resources for future generations. This transition also presents great economic opportunities.

Generative AI (GenAI) offers a powerful toolset for enhancing sustainability initiatives. Its capacity to interpret and democratize data across diverse departments facilitates a more comprehensive and data-driven approach. In this rapidly advancing digital age, AI has transformed the landscape of accounting, and it also provides us with tools to address some of the most pressing environmental challenges of our time. For example, GenAI can automate the analysis of sustainability-related financial disclosures, enabling more accurate and transparent reporting. It's essential that we, as accountants, lead the change in integrating these technologies to promote transparency, accountability, and sustainability.

Throughout this conference, we will have the privilege of sharing knowledge with delegates from the Academia and Professionals, who will share their insights and experiences on how our profession can adapt and grow by leveraging AI for sustainable development. Our discussions and interactions will indeed pave the way for new methodologies and frameworks that benefit both the world of theory and Practice.

We are grateful to our keynote Speaker and the Vice-Chancellor, of Federal University Lokoja, Prof. Olayemi Akinwumi, for graciously accepting that the Conference should be hosted in collaboration with the University. I also acknowledge the efforts of the Head of the Department, Accounting, who also doubles as the Chairman of the Local Organising Committee of ACAF, Prof. Emmanuel Onoja, FCA, in working towards the fruition of the 10th ACAF. Thank you!

We also appreciate our Lead Paper presenter, a Scholar of repute, who is a one-time winner of the Professorial Inaugural Lecture of our great Institute, Prof. Onafowokan O. Oluyombo, ACTI, FCA of the Department of Accounting, Pan Atlantic University, Lagos and our Guest speaker, Temitope O. Fagbemi, Ph.D., FHEA, CMBE, FAIA, FCA of the Aberdeen Business School, Robert Gordon University, Scotland, Uk, thank you for accepting to share your knowledge and insight with us at this Conference.

I encourage all paper presenters to approach the review process with an open mind, as their papers will undergo thorough scrutiny by respected experts in their fields. It's important to recognize that no research is perfect, and the review process aims to enhance the quality of the various submissions. Ultimately, our goal is to improve both our individual and collective skills in conducting research that meets global standards.

I am pleased to let our Participants know that exceptional papers and insightful recommendations arising from this conference will be published in the prestigious International Journal of Contemporary Accounting Issues (IJCAI). These publications are invaluable reference materials for academics and practitioners alike, and they offer a significant boost to the career progression of our academic colleagues.

Our deep appreciation also goes to the Research Committee of the Institute, ably led by the 1st Deputy Vice President of the Institute, Hajia Queensley S. Seghosime, mni, FCA. The Research Committee is the Council's Committee in charge of the Institute's academic conference. Also, the Academic Conference sub-committee of the Research Committee, under the leadership of Prof. Olubunmi Florence Osemene, FCA, sacrificed immensely to ensure the success of this Conference.

Once again, I welcome you all to the 10th Annual International Academic Conference on Accounting and Finance. Please do have an intellectually rewarding time.

Thank you.

Chief Davidson Chizuoke S. Alaribe, FCA
60th President
The Institute of Chartered Accountants of Nigeria

A KEYNOTE ADDRESS DELIVERED BY THE VICE-CHANCELLOR, FEDERAL UNIVERSITY LOKOJA, PROFESSOR OLAYEMI AKINWUMI, AT THE ANNUAL INTERNATIONAL ACADEMIC CONFERENCE ON ACCOUNTING AND FINANCE, ORGANIZED BY THE INSTITUTE OF CHARTERED ACCOUNTANTS OF NIGERIA (ICAN) IN COLLABORATION WITH FEDERAL UNIVERSITY LOKOJA, ON MONDAY, MARCH 24, 2025, AT FEDERAL UNIVERSITY LOKOJA, KOGI STATE

Protocol

- Distinguished Guests
- Principal Officers of the University
- Lead Paper Presenters
- Guest Speakers
- Respected Scholars and Practitioners
- Dear Participants
- Ladies and Gentlemen.

It is with great pleasure and a deep sense of responsibility that I welcome you all to this Annual International Conference on Accounting and Finance, hosted here at Federal University Lokoja. As your Chief Host, I am honored to address this distinguished gathering of scholars, practitioners, and industry leaders who have convened to deliberate on a theme of paramount importance: **Gen AI-Sustainability Nexus: Charting New Paths in Accounting for a Greener Economy.** This theme is not only timely but also crucial as we navigate the complexities of integrating artificial intelligence and sustainability in the accounting and finance practices.

To begin with, I wish to express our profound appreciation to the organizing committee for their dedication in ensuring the success of this conference. At Federal University Lokoja, we take pride in hosting conferences that contribute to the advancement of knowledge and professional practice, and we are delighted to provide a platform for this critical discussion.

The theme of this conference is particularly significant in today's world, where sustainability model has become a global priority. Artificial Intelligence (AI), particularly Generative AI (Gen AI), is revolutionizing how we collect, analyze, and interpret financial data. In this era of rapid technological advancements, leveraging AI-driven innovations can enable organizations to embed Environmental, Social, and Governance (ESG) considerations into their financial decision-making processes.

The intersection of **Generative AI and Sustainability in Accounting** is an exciting space, as these technologies could significantly transform how businesses track, report, and manage environmental and social impact. Some key areas where the Gen AI-Sustainability nexus could reshape accounting for a greener economy include:

- **Enhanced Environmental Impact Reporting:** AI can automate the collection and analysis of sustainability data, ensuring more accurate and transparent environmental disclosures.
- **Sustainable Auditing and Compliance:** AI-powered tools can enhance auditing by detecting anomalies, assessing sustainability compliance, and improving accountability.

- **Carbon Footprint Tracking and Prediction:** AI-driven models can forecast carbon emissions and resource consumption, helping organizations align with global climate goals.
- **Optimized Resource Allocation:** Predictive analytics can help businesses allocate resources efficiently while minimizing waste and energy consumption.

Furthermore, Gen AI has the potential to streamline auditing processes, detect fraudulent activities, and optimize supply chain management, all while minimizing environmental impact. As accounting professionals, embracing these technological advancements will position us at the forefront of sustainable financial management.

To achieve a greener economy, we must prioritize sustainable accounting practices that align with global frameworks such as the United Nations Sustainable Development Goals (SDGs) and the Paris Agreement on climate change. Financial institutions and corporate organizations must integrate ESG metrics into their accounting models, ensuring that profitability and sustainability are mutually reinforcing.

At Federal University Lokoja, we are committed to fostering academic research and industry collaborations that address contemporary challenges in sustainability and technology. Our scholars are actively engaged in cutting-edge research on sustainable finance, AI applications in accounting, and environmental management. This conference aligns with our vision of bridging the gap between academia and industry in driving sustainable economic transformation.

As we engage in insightful discussions throughout this conference, I encourage all participants to exchange ideas, forge partnerships, and develop actionable solutions that will redefine the role of accounting and finance in promoting sustainability.

While you are here, I urge you to take some time to enjoy the sights and sounds of our historic and confluence city of Lokoja. Known for its rich history and cultural heritage, Lokoja offers many attractions that I am sure you will find fascinating and enriching.

Conclusion

Ladies and gentlemen, the intersection of Generative AI and sustainability presents unprecedented opportunities for the accounting and finance professions. By harnessing the power of AI-driven innovations, we can create financial models that are not only efficient but also environmentally responsible. Let this conference serve as a platform for groundbreaking research, transformative ideas, and progressive policies that will shape the future of accounting for a greener economy.

On this note, I would like to extend our heartfelt appreciation to our distinguished keynote speakers and lead paper presenters. Your contributions to this critical discourse will undoubtedly inspire new perspectives and drive meaningful change in the field of accounting and finance.

It is now my great honor to declare the Annual International Conference on Accounting and Finance officially open. I wish you all a fruitful and impactful conference.

Thank you, and welcome to Federal University Lokoja.

Professor Olayemi Akinwumi
Vice-Chancellor

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NAVIGATING RISKS, DRIVING PERFORMANCE: UNVEILING THE IMPACT OF RISK MANAGEMENT STRATEGIES IN NIGERIAN FINANCIAL INSTITUTIONS

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ABSTRACT

This study uses panel data regression analysis to investigate how risk management methods affect Nigerian banks' financial performance. Between 2014 and 2023, information was gathered from 10 financial firms that were listed on the Nigerian Stock Exchange. The research assesses the effects of leverage, credit risk, liquidity risk, and operational risk on bank profitability as determined by ROA and ROE. Higher cost-to-income ratios and aggressive lending methods have been shown to substantially reduce asset returns, however the impact on equity returns varies depending on the bank. Diagnostic tests assist the usage of random effects estimates and validate the model's resilience. These findings highlight the necessity of all-encompassing risk management plans to reduce negative effects and improve financial performance, providing useful information for developing market banking professionals and regulators.

Keywords: *Risk Management; Bank Performance; Nigerian Financial Institutions; Panel Data Analysis; Financial Stability.*

1.0 INTRODUCTION

1.1 Background of the Study

Risk is an unavoidable part of banking. Managing it effectively determines a bank's success or failure. Poor risk management has led to financial crises, while strong strategies have helped banks grow and remain stable. Risk management remains an essential function for financial institutions, serving as the backbone of sustainable operations and profitability. Risk management is a cornerstone of the financial sector, encompassing strategies to identify,

assess, and mitigate risks such as credit risk, market risk, operational risk, and liquidity risk. In Nigeria, where financial institutions are pivotal to economic development, the absence of effective risk management strategies has led to recurrent systemic failures and financial crises (Oye, 2020). With emerging challenges such as fluctuating oil prices, increasing digitalization, and regulatory changes, evaluating the impact of risk management strategies on firm performance is both timely and essential. This study seeks to bridge the gap in literature by providing insights tailored to the unique dynamics of Nigeria's financial sector, fostering enhanced performance and resilience.

Strategic risk management in financial institutions is a comprehensive approach that integrates risk management practices with the strategic objectives and operations of the organization (Arowoshegbe & Fagbemi 2019). It involves identifying, assessing, managing, and monitoring potential risks that could adversely affect the institution's ability to achieve its goals. Given the complexity and volatility of the financial sector, effective strategic risk management is crucial for ensuring both the stability and regulatory compliance of financial institutions (Dabari & Saidin 2014).

This paper examines how risk management practices influence financial performance in Nigerian banks. It focuses on key risk areas: operational, credit, liquidity, and leverage. By analyzing their impact on return on assets (ROA) and return on equity (ROE), the study sheds light on whether these practices create value or simply serve as regulatory requirements.

Many studies have explored the relationship between risk management and bank performance. However, most focus on global or regional markets with limited insights into Nigeria's financial sector. Existing research often examines risk types separately, without considering their combined effect on profitability. This study fills the gap by analyzing multiple risk indicators together and assessing their collective impact on financial performance. It also incorporates updated financial metrics and examines new trends in the Nigerian banking sector.

1.2 Objectives

i. Assess the impact of operational risk (CIR) on bank profitability

ii. Evaluate how credit risk (NPLR) influences financial performance

iii. Determine the effect of liquidity risk (LQR) on ROA and ROE

iv. Analyze how leverage (LTDR) affects bank stability and returns

v. Provide insights into the effectiveness of current risk management strategies in Nigerian banks

2.0 LITERATURE REVIEW

Specifically in the Nigerian environment, risk management has become an essential element in guaranteeing the stability and resilience of financial institutions. Soin & Collier (2013) noted that global financial crisis' aftermath has shown how crucial strong risk management frameworks are to preserving these financial institutions' long-term sustainability and profitability.

2.1 Conceptual Framework

2.1.1 Risk and Risk Management

According to the Institute of Risk Management (https://www.theirm.org/about/r), risk is the sum of the likelihood of an occurrence and its effects. Risk inherently carries uncertainty, making it both unpredictable and uncontrollable. Accountants refers it to the unpredictability of future events that may lead to either positive or negative outcomes. For example, an investor may allocate funds to a project that could either generate significant returns or result in financial losses, depending on market conditions and other unforeseen factors. The study of Olademiji (2022) noted that the 70s saw a significant change in the financial sector's approach to risk management, with banks, insurers, and other businesses placing a greater emphasis on controlling financial risks. Companies aggressively addressed their exposure to market variations during this time, including changes in commodity pricing, stock market performance, interest rate volatility, and exchange rate movements. Identifying, assessing, mitigating, and tracking future uncertainties in relation to company performance and goals is the goal of the risk management process. The methodical process of recognizing, evaluating, and mitigating any hazards is known as risk management. It is a continuous procedure that is essential to decision-making and aids businesses in successfully navigating ambiguity (Jabbour & Abdel-Kader, 2015).

2.1.2 Risk Management in Nigerian Financial Institutions

Risk management is used by Nigerian financial institutions to limit possible risks and safeguard asset value. According to Tursoy (2018), these institutions use frameworks intended to protect stakeholder interests and secure day-to-day operations. In situations when financial uncertainties are prevalent, financial institutions see risk management as an essential component of adding value. Babatunde, Rafiu, and Olaide (2023) noted that a major reform initiative by banking regulators was the creation of the Basel Committee on Banking Supervision (BCBS). The committee required that banks in all member countries, along with their controlled entities, adjust their risk management practices to meet specified prudential standards within a set timeframe. These guidelines were specifically designed to address risks

in operational, credit, and market areas. By doing so, banks are expected to adopt measures that allow for clear and consistent evaluation of risks across these sectors. This reform aims to ensure that banks not only measure their risks accurately but also regulate their risk management practices effectively, aligning them with global standards as outlined by the BCBS (Babatunde, Rafiu, & Olaide, 2023).

Financial experts may take an integrative strategy to their operations and the risks involved when they practice effective risk management. Managers may assign clear roles and establish systematic processes for execution, assessment, and frequent review by seeing the institution as an integrated organism rather of separating risks by specific departments (Ayodele and Alabi, 2014). This all-encompassing method guarantees that each aspect of the bank's operations is examined and in line with a single risk management plan, creating an atmosphere where risks are recognized in their full context and dealt with collaboratively.

Financial institutions use quantitative metrics including the probability of borrower default, acceptable risk levels, average risk exposure, and possible losses in the event of default to examine lending operations in the scope of credit risk management. Konovalova et al. (2016) emphasize that these metrics—ranging from the number of loans issued to the proportion of problematic loans—serve as indicators for assessing and mitigating credit risk.

In parallel, market risk management is as also important. As Redja (2006) emphasized, financial institutions must implement strict controls over market risks, given the inherent likelihood of severe losses from market changes. Because market risk is inherently uncontrolled and needs ongoing attention to prevent unavoidable losses, this ongoing monitoring is crucial.

Liquidity and operational risk management are equally important. According to Ayodele and Alabi (2016), banks should make managing liquidity risk a key component of their operating strategy. They could do this by putting in place reliable mechanisms to guarantee enough liquidity through frequent evaluations of financing arrangements. Operations risk management, on the other hand, deals with issues brought on by unethical behavior, disparities in cash handling, and transactional blunders. Even as banking operations get more varied and intricate, trust is established and maintained through efficient risk management, which guarantees timely and correct client transaction execution (Ayodele and Alabi, 2014). In a volatile financial climate, this all-encompassing approach to risk management improves the bank's overall performance and helps to preserve stability.

2.2 Theoretical Review

Modern Portfolio Theory (MPT) is a fundamental concept in finance that describes how investors can build portfolios to minimize risk and maximize returns. Markowitz (1952) developed the theory, demonstrating that risk is affected by correlations between assets rather than just the sum of the risks of individual assets. By combining assets that do not move perfectly in tandem, an investor can lower the overall volatility of the portfolio. This approach offers a framework to achieve an optimal risk-return trade-off, which is essential to portfolio construction. MPT relies heavily on diversity. By distributing investments over a number of assets, diversification helps to mitigate the negative effects of any one asset's poor performance on the portfolio as a whole. According to Markowitz (1952, 1959), unsystematic risk—risk unique to individual investments—can be significantly reduced when assets with low or negative correlations are pooled. In addition to stabilizing profits over time, this risk reduction aids investors in better managing market uncertainty. By presenting the Capital Asset Pricing Model (CAPM), which expands on MPT to connect an asset's projected return with its systematic risk, Sharpe (1964) further developed these ideas.

Banks and other financial institutions' investment plans have been impacted by the real-world implementation of MPT. To manage their investment portfolios, these organizations use diversification techniques, which distribute risks among different asset classes and market sectors. Banks seek to strike a balance between risk and reward by using MPT principles, allocating funds to ventures that provide the best returns relative to the degree of risk taken. This method has proven essential to contemporary risk management procedures, offering a strong theoretical basis for wise investment choices in unpredictable economic times.

2.3 Empirical Review and Hypothesis Development

By demonstrating that sound risk management practices are positively linked to improved bank performance and that profitability is largely driven by the integration of risk management and robust corporate governance, Akindele et al (2014) conducted foundational research in Nigeria that examined the relationship between risk management and corporate governance on bank performance. This early work paved the way for subsequent studies by establishing the critical role that comprehensive risk oversight plays in enhancing the value of banking institutions.

Building on this, Adekunle et al. (2015) focused on credit risk management as a key contributor to the value creation process in Nigerian deposit money banks. By examining variables such as loan and advance loss provisions, total loans and advances, non-performing loans, and total assets in relation to accounting equity return (ROE) and asset return (ROA), their study

underscored that effective credit risk management significantly bolsters financial stability. The authors recommended that maintaining low levels of non-performing loans relative to credit allowances is essential for boosting equity returns and overall financial efficiency.

Further extending the empirical evidence, Ng'aari (2016) explored the impact of various risk management practices on the profitability of listed commercial banks in Kenya over the period 2002-2015. Utilizing panel regression analysis and secondary data on liquidity, credit, and operational risks, the study revealed that all three risk management dimensions positively and significantly correlate with bank profitability. This body of work supports the hypothesis that effective risk management practices contribute to enhanced financial performance, thereby reinforcing the following propositions:

H_0: Risk management practices do not impact positively on the financial performance of banks;
H_1: Risk management practices impact positively on the financial performance of banks.

3.0 METHODOLOGY

This study employs a panel data regression analysis using annual data from 10 financial institutions listed on the Nigerian Stock Exchange, covering the period from 2014 to 2023. Data will be sourced from the annual reports of Access Bank, Fidelity Bank, First City Monument Bank, First Bank, Guaranty Trust Bank, United Bank for Africa, Zenith Bank, Citibank Nigeria, Ecobank Nigeria, and Stanbic IBTC Bank. The baseline model is specified as follows:

$$FP_{it} = f(OperationRisk, CreditRisk, LiquidityRisk, LeverageRisk)$$

$$ROA_{it} = \beta_0 + \beta_1 CIR_{it} + \beta_2 NPLR_{it} + \beta_3 LQR_{it} + \beta_4 LTDR_{it} + \varepsilon_{it}$$

$$ROA_{it} = \beta_0 + \beta_1 CIR_{it} + \beta_2 NPLR_{it} + \beta_3 LQR_{it} + \beta_4 LTDR_{it} + \varepsilon_{it}$$

Table 1: Measurement of Variables

Variable	Category	Definition	Measurement Formula
ROA	Dependent	Bank profitability measured as return on assets	Net profit / Total assets
ROE	Dependent	Bank profitability measured as return on equity	Net profit / Shareholders' equity
CIR	Independent	Operational risk indicated by cost efficiency	Operating costs (minus bad and doubtful debt) / Net interest income (including

			non-interest income)
NPLR	Independent	Credit risk measured by the ratio of non-performing loans	Non-performing loans / Total loans and advances
LQR	Independent	Liquidity risk measured by the liquid asset coverage ratio	Total specified liquid assets / Total current liabilities
LTDR	Independent	Leverage risk measured by the loan-to-deposit ratio	Total loans / Total deposits

Source: Authors' Compilation

Where, FP_{it} represents the financial performance (using ROA and ROE as a proxy) of bank i at time t, while $OperationRisk_{it}$, $CreditRisk_{it}$, $LiquidityRisk_{it}$, and $LeverageRisk_{it}$ denote the measures for operational, credit, liquidity, and leverage risks respectively. β_0 is the intercept, β_1–β_4 are the coefficients for the respective independent variables, and ε_{it} is the error term capturing unexplained variations.

The analysis will be executed using ordinary least squares (OLS) regression adapted for panel data, allowing the incorporation of both cross-sectional and time-series effects. Regression diagnostics will be applied to ensure the robustness of the findings—these include tests for heteroscedasticity, multicollinearity, and autocorrelation, as well as checks for the normality of residuals. The model's goodness-of-fit will be assessed, and potential endogeneity issues will be addressed through appropriate tests and corrective measures. This methodology provides a rigorous framework to examine the impact of risk management practices on the financial performance of Nigerian banks.

4.0 DATA ANALYSIS

Table 2: Descriptive Statistics

	ROA	ROE	CAR	CIR	LQR	LTDR
Mean	4.211995	35.67317	18.83200	59.74284	40.84142	51.90064
Median	4.106743	36.98676	19.05000	58.59720	38.87507	55.42141
Maximum	7.360670	63.42592	32.60000	399.3686	82.57959	72.49081
Minimum	1.317713	9.968327	-13.81000	21.60861	9.901956	7.269756
Std. Dev.	1.280786	9.432945	5.516808	40.04883	14.42749	13.45027

Obs	100	100	100	100	100	100

Source: Authors' Computation with Eviews (2025)

The descriptive statistics for 100 observations of important variables are shown in Table 2. With a moderate spread (std. dev. 1.28) and an average ROA of around 4.21%, banks appear to have rather consistent asset returns. Similar to this, the average return on equity (ROE) is strong at around 35.67%, but its greater variability (std. dev. 9.43) indicates that banks' efficiency in generating returns on equity varies significantly. The majority of banks cluster around the average Capital Adequacy Ratio (CAR), which is 18.83%. However, the negative minimum number indicates a key outlier, suggesting possible capital shortages in at least one case. Though it ranges widely from a highly efficient 21.61% to an inefficient 399.37%, the Cost-to-Income Ratio (CIR) averages close to 60%, highlighting operational disparities within institutions. The Liquidity Coverage Ratio (LQR), which measures liquidity, averages 40.84%. This means that banks normally keep liquid assets that cover 41% of their obligations, albeit there is some variance (std. dev. 14.43). Lastly, banks give out around 51.90% of their deposits on average, according to the Loan-to-Deposit Ratio (LTDR), with a considerable dispersion that suggests some variation in lending practices.

Table 3: Correlation Matrix

	ROA	**ROE**	**CAR**	**CIR**	**LQR**	**LTDR**
ROA	1.00	0.60	0.06	-0.23	0.04	-0.37
ROE	0.60	1.00	-0.13	-0.09	-0.03	0.04
CAR	0.06	-0.13	1.00	-0.25	0.13	-0.02
CIR	-0.23	-0.09	-0.25	1.00	0.29	0.15
LQR	0.04	-0.03	0.13	0.29	1.00	0.15
LTDR	-0.37	0.04	-0.02	0.15	0.15	1.00

Source: Authors' Computation with Eviews (2025)

Table 3 highlights key correlations among performance and risk measures. ROA and ROE are strongly positively related (0.60), suggesting that higher asset returns tend to boost equity returns. Meanwhile, ROA shows moderate negative correlations with LTDR (-0.37) and CIR (-0.23), implying that aggressive lending and higher operating costs can reduce asset returns. Other correlations are relatively weak, though the positive link between CIR and LQR (0.29) indicates that financial institutions with higher operating costs may maintain larger liquidity

buffers. Overall, the matrix underscores the need to manage risk factors carefully to enhance bank profitability.

Table 4: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Variables	chi2(1)	Prob > chi2	Decision
ROA	0.92	0.3363	Constant Variance
ROE	3.42	0.0643	Constant Variance

Source: Authors' Computation with Eviews (2025)

H_0: Constant variance

Table 4 presents the Breusch-Pagan/Cook-Weisberg test results for heteroskedasticity. For ROA, the chi-squared value is 0.92 with a p-value of 0.3363, indicating that we fail to reject the null hypothesis of homoskedasticity; there is no evidence of heteroskedasticity in the ROA model. In the case of ROE, the chi-squared value is 3.42 with a p-value of 0.0643, which, although closer to the significance threshold, still suggests that at the 5% level we do not have sufficient evidence to reject homoskedasticity.

Table 5: Test for Multicollinearity for the Independent Variables

	VIF	1/VIF
CAR	1.12	0.8928
CIR	1.22	0.8226
LQR	1.16	0.8626
LTDR	1.04	0.9641

Source: Authors' Computation with Eviews (2025)

Table 5 reports the Variance Inflation Factor (VIF) values for the independent variables. All VIF values are below 10, suggesting that there is no significant multicollinearity between the independent variables, indicating that they are not highly correlated with each other and can be included together in the regression model without concern for multicollinearity.

Table 6: Pooled OLS Estimation

	ROA		ROE	
Variable	Coefficient	Prob.	Coefficient	Prob.
CAR	-0.0060	0.7908	-0.2802	0.1278

CIR	-0.0071	0.0319	-0.0340	0.1967
LQR	0.0140	0.1157	0.0128	0.8572
LTDR	-0.0346	0.0002	0.0410	0.5704
C	5.9701	0.0000	40.3320	0.0000
R-squared	0.1896		0.0354	
Adjusted R-squared	0.1555		-0.0052	
F-statistic	5.5566		0.8712	
Prob(F-statistic)	0.0005		0.4842	

Source: Authors' Computation with Eviews (2025)

For ROA, the pooled OLS results reveal that the model explains around 16% of the variance in asset returns (adjusted R-squared = 0.1555), and the overall model is statistically significant (F-statistic p = 0.0005). Notably, the cost-to-income ratio (CIR) and the loan-to-deposit ratio (LTDR) have significant effects on ROA, with CIR showing a negative coefficient (-0.0071, p = 0.0319) and LTDR also exhibiting a significant negative impact (-0.0346, p = 0.0002). In contrast, the capital adequacy ratio (CAR) and the liquidity coverage ratio (LQR) do not significantly affect ROA.

For ROE, the model performs poorly, with an R-squared of only 3.54% and an insignificant overall F-statistic (p = 0.4842). None of the risk management variables—CAR, CIR, LQR, or LTDR—demonstrate a statistically significant impact on ROE, suggesting that the selected predictors do not adequately capture the factors influencing equity returns in this context. This lack of significance implies a need to explore additional variables or alternative models to better understand the drivers of bank profitability as measured by ROE.

Table 7: Fixed Effect Estimation

	ROA		**ROE**	
Variable	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
CAR	-0.0259	0.1857	-0.4097	0.0085
CIR	-0.0071	0.0090	-0.0543	0.0104
LQR	0.0028	0.7675	0.0539	0.4691
LTDR	-0.0319	0.0001	-0.0009	0.9882
C	6.6634	0.0000	44.4792	0.0000
R-squared	0.5610		0.5044	
Adjusted R-squared	0.4946		0.4295	
F-statistic	8.4531		6.7337	
Prob(F-statistic)	0.0000		0.0000	
CROSS SECTION EFFECT				
Access Bank	-0.4906		-1.3677	

Fidelity Bank	0.0553	3.0863
First City Monument Bank	0.4136	4.0949
First Bank	0.6945	6.5985
Guaranty Trust Bank	1.0489	-2.1478
United Bank of Africa	-0.1500	3.7343
Zenith Bank	0.3166	-4.5674
Citibank Nigeria	-1.9705	-16.0406
Ecobank Nigeria	-0.4312	7.4663
Stanbic IBTC Bank	0.5135	-0.8569

Source: Authors' Computation with Eviews (2025)

For ROA, the fixed effects model explains approximately 56% of the variance, with significant negative effects for CIR and LTDR. An increase in the cost-to-income ratio (CIR) is associated with a decline in ROA (p=0.0090), while a higher loan-to-deposit ratio (LTDR) also significantly reduces asset returns (p=0.0001). The capital adequacy ratio (CAR) and liquidity coverage ratio (LQR) do not significantly influence ROA, indicating that these measures have a less direct impact on asset profitability. The overall model is robust, with an F-statistic showing significance at the 0.0000 level.

For ROE, the fixed effects estimation accounts for about 50% of the variance in equity returns. Both CAR and CIR significantly and negatively impact ROE, with p-values of 0.0085 and 0.0104, respectively, implying that higher capital adequacy requirements and increased operating costs are detrimental to equity returns. LQR and LTDR, however, are not statistically significant for ROE. Additionally, the cross-section effects indicate variability among banks, reflecting that individual bank characteristics play an important role in influencing profitability outcomes.

The cross-section effects in the fixed effects estimation capture the inherent differences across banks in explaining asset returns (ROA) beyond the risk management variables. For example, Guaranty Trust Bank shows a positive bank-specific effect (1.0489), suggesting it tends to achieve higher ROA than the sample average when other factors are held constant, while Citibank Nigeria exhibits a negative effect (-1.9705), indicating relatively lower asset returns. Other banks such as First Bank (0.6945) and First City Monument Bank (0.4136) also show positive deviations, whereas Access Bank (-0.4906) and United Bank for Africa (-0.1500) reflect negative fixed effects, emphasizing that bank-specific characteristics play a role in influencing performance outcomes.

Similarly, the cross-section effects for ROE reveal distinct bank-level impacts on equity returns. First Bank stands out with a notably high positive effect (6.5985), implying a strong inherent ability to generate returns on equity, while Citibank Nigeria again demonstrates a large

negative effect (-16.0406), underscoring its relative underperformance in this area. Fidelity Bank (3.0863) and First City Monument Bank (4.0949) also contribute positively, whereas Guaranty Trust Bank (-2.1478) and Zenith Bank (-4.5674) show negative effects, highlighting the variability in bank-specific management practices and operational strategies that influence overall profitability.

Table 8: Random Effect Estimation

	ROA		ROE	
Variable	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
CAR	-0.0241	0.2107	0.0098	0.0098
CIR	-0.0071	0.0080	0.0126	0.0126
LQR	0.0049	0.5914	0.5024	0.5024
LTDR	-0.0324	0.0001	0.9510	0.9510
C	6.5744	0.0000	44.4792	0.0000
R-squared	0.2333		0.1057	
Adjusted R-squared	0.2010		0.0680	
F-statistic	7.2252		2.8064	
Prob(F-statistic)	0.0000		0.0299	

Source: Authors' Computation with Eviews (2025)

In the ROA model, the random effects estimation indicates that the cost-to-income ratio (CIR) and the loan-to-deposit ratio (LTDR) have significant negative effects on asset returns, with coefficients of -0.0071 (p=0.0080) and -0.0324 (p=0.0001) respectively. In contrast, the capital adequacy ratio (CAR) and liquidity coverage ratio (LQR) do not significantly affect ROA, with p-values of 0.2107 and 0.5914. The overall model explains about 23% of the variability in ROA (R-squared=0.2333), and the significant F-statistic (p=0.0000) confirms the model's reliability in explaining the asset returns across banks.

For the ROE model, the estimation shows that CAR and CIR exhibit statistically significant positive effects on equity returns, with both variables having p-values of 0.0098 and 0.0126 respectively. However, LQR and LTDR are not significant predictors of ROE, as indicated by their high p-values. The ROE model has a lower explanatory power (R-squared=0.1057), suggesting that other factors may also be influencing equity returns, though the overall model remains statistically significant (F-statistic p=0.0299).

Table 9: Hausman Test - Post Estimation Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
ROA Model	3.286741	4	0.511
ROE Model	1.438468	4	0.8375

Source: Authors' Computation with Eviews (2025)

The Hausman test for the ROA model yields a Chi-square statistic of 3.29 with 4 degrees of freedom and a p-value of 0.511. This high p-value indicates that there is no significant difference between the fixed and random effects estimators, supporting the null hypothesis that the random effects model is appropriate and that its estimates are consistent. For the ROE model, the Chi-square statistic is 1.44 with 4 degrees of freedom, and the corresponding p-value is 0.8375. This result also supports the use of the random effects specification, as the test fails to reveal any systematic differences between the fixed and random effects estimates. Overall, the Hausman test results confirm that the random effects model is the preferred specification for both the ROA and ROE models.

5.0 DISCUSSION ON FINDINGS

The descriptive and regression analyses provide a comprehensive view of how risk management practices influence financial performance of Nigerian financial institutions. Descriptive statistics reveal that banks maintain moderate profitability levels, with ROA and ROE showing a strong positive correlation. The correlation matrix also indicates that aggressive lending practices and high operating costs, as evidenced by negative associations between ROA and LTDR as well as ROA and CIR, can diminish asset returns. This pattern is further reinforced by pooled OLS results where both CIR and LTDR significantly lower ROA. Fixed effects models support these findings by highlighting significant negative impacts of CIR and LTDR on ROA, while random effects estimation confirms these relationships, underscoring the importance of managing operational and credit risks to safeguard asset profitability.

The effect on ROE, however, is more complex. According to the fixed effects model, both CAR and CIR considerably lower ROE, indicating that excessive operational and capital adequacy expenses may compromise equity returns. In contrast, the random effects model indicates that these variables have a positive impact on ROE; this discrepancy is a reflection of the random effects approach's ability to capture bank-specific features. For both ROA and ROE, the Hausman test validates the random effects model, indicating that variations among banks are crucial in elucidating performance results. Overall, the results show that in the dynamic Nigerian banking industry, efficient risk management is essential, especially for reducing operational and credit risks, in order to increase asset and equity profitability.

6.0 CONCLUSION AND RECOMMENDATION

The study confirms that effective risk management practices are crucial in enhancing the financial performance of Nigerian banks. The empirical evidence indicates that operational risk

(CIR) and credit risk (LTDR) have significant negative effects on asset returns (ROA), while the impact on equity returns (ROE) is more nuanced and varies depending on bank-specific characteristics. The pooled, fixed, and random effects estimations consistently highlight that high operating costs and aggressive lending practices reduce profitability. Moreover, the Hausman test validates the random effects model, suggesting that cross-sectional differences among banks play an important role in determining performance outcomes. These findings underscore the need for banks to integrate comprehensive risk management strategies that address both operational inefficiencies and credit exposures.

Based on the results, it is recommended that Nigerian financial institutions focus on improving internal risk control mechanisms to reduce operating costs and mitigate credit risk. Banks should regularly review and refine their risk management policies, particularly targeting the reduction of LTDR and optimizing their cost-to-income ratios. Additionally, regulators should consider reinforcing guidelines that promote robust risk management practices, ensuring that banks remain resilient in the face of market uncertainties. Future research could expand the scope by incorporating additional variables and extending the analysis to capture longer-term trends, thereby providing a more detailed understanding of the factors influencing bank profitability.

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CARBON DISCLOSURE AND FINANCIAL PERFORMANCE OF SELECTED MANUFACTURING COMPANIES

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ABSTRACT

Financial performance is a critical issue in an organisation. Existing literature suggests a decline in the financial performance of multinational manufacturing companies due to inadequate carbon disclosure policy. Hence, this study assessed the effect of carbon investments and savings on the social return on investment of listed manufacturing companies in Nigeria. An ex-post facto research design was adopted in this study. Using the purposive sampling technique, seven multinational manufacturing companies were selected out of the population of the ten listed on the Nigerian Exchange Group as of 31st December 2022. Data were sourced from the companies' annual and stand-alone sustainability reports from 2017-2022. The data sourced were analysed using the panel regression analysis. The findings further showed that the disclosure practices of the selected companies had a non-significant effect on social return on investment (F=2.13; p=0.13). The study concluded that carbon-related financial disclosure does not significantly affect the social return on investment of multinational manufacturing companies in Nigeria. The study recommended that manufacturing companies should further increase their disclosure due to the positive effect observed, particularly in their carbon savings and carbon investment in currency values, not just metric tonnes.

Keywords: *Carbon Disclosure, Carbon Emissions, Financial Performance, Social Return on Investment.*

1.0 INTRODUCTION

The issues driving the solid financial performance of manufacturing businesses and evaluating business approaches have experienced substantial shifts in literature much beyond book values (Aguguom et al., 2022). Nzekwe et al. (2021) opine that unsettling factors include the global manufacturing businesses' dwindling comparative competitive advantage, insufficient overlap across financial performance variables, and the fact that they are highly integrated. Some financial success statistics of international corporations in Nigeria are generally inflated, and some assumptions around them need more substantial validity (Osho, 2019).

Investors increasingly recognise the importance of environmental, social, and governance (ESG) factors in their investment decisions, including carbon disclosure, because disclosure of carbon emissions and environmental practices has evolved from a mere corporate responsibility to an economic necessity (Arumona et al., 2021). Carbon disclosure is crucial in this context, as it offers transparency regarding an organisation's carbon emissions, emission reduction strategies, and overall environmental impact (Busch et al., 2020). The level of detail and transparency in carbon-related disclosures can vary significantly among companies (Okudo & Amahalu, 2021). Some companies may provide detailed information on their carbon footprint and efforts to reduce emissions, while others may provide only limited information. Investors are interested in understanding how these disclosed environmental metrics may influence the financial performance of their companies (Boffo & Patalano, 2020).

According to a report by the Carbon Disclosure Project (CDP, 2021) and Okeke et al. (2021), corporate carbon reporting has increased worldwide over the last few years. The study of carbon disclosure has gained importance in recent years to help firms communicate climate change activities to their stakeholders through environmental disclosures (Siddique et al., 2021). This is primarily because many corporate stakeholders consider climate change issues increasingly fundamental. This has caused attention to shift to the impacts of carbon emissions on corporate activities. Reducing carbon emissions is fundamental to sustainable development (Okeke et al., 2021). Carbon-related disclosure offers information about a company's GHG emissions, carbon footprint, and efforts to reduce these emissions (Hatta & Marietza, 2021), and these disclosures can be found in a company's sustainability or corporate social responsibility (CSR) report. Carbon disclosure can give stakeholders a better idea of a company's environmental impact, risks, and opportunities associated with climate change.

In line with the Paris Agreement, the International Sustainability Standards Board (ISSB) has issued its inaugural standards, IFRS S1 and IFRS S2, ushering in a new era of sustainability-related disclosures in global capital markets (IFRS Foundation, 2023). The standard enhances investor confidence and reliance on corporate carbon disclosures. The ISSB Standards guarantee that businesses provide information on sustainability in the same reporting package as their financial accounts. The International Sustainability Reporting Board (ISSB) builds upon the efforts of market-driven, investor-oriented reporting initiatives like the Task Force for Climate-related Financial Disclosures (TCFD) and the Climate Disclosure Standards Board (CDSB).

One of the key challenges in understanding the effect of carbon disclosure and investment returns lies in the variations that different disclosure practices may have on financial performance. Despite the substantial growth in global sustainable investment assets and the integration of ESG factors by institutional investors, there is a need to examine the effect between Carbon Disclosure and Social Return on Investment (SROI). Furthermore, while there is an awareness of the potential financial liabilities and legal repercussions associated with neglecting ESG factors, including carbon-related financial disclosure, the specific mechanisms through which these factors influence SROI still need to be fully understood. Investors and businesses must understand the role of carbon disclosure as a risk management tool in mitigating environmental risks and its impact on consumer preferences and revenue generation. This study population comprises ten listed multinational manufacturing companies in Nigeria drawn from various sectors from 2017 to 2022, out of which seven were purposively chosen. For this study, the Social Return on Investment is the proxy for financial performance, the dependent variable. In contrast, carbon savings and carbon-related investment were adopted as a proxy for the Independent variable, carbon disclosure. This research contributes to advancing sustainable corporate practices in Nigeria as regulatory bodies will draw inferences from this study to consider making a compulsory commitment to environmental accounting.

2.0 LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Carbon Disclosure

The term "disclosure" is becoming more used in conversations on climate change. It is a sub of the Environmental, social, and governance framework (ESG). Carbon disclosure is the disclosure of information by an organisation, such as GHG emissions intensity and energy use, participation in emissions trading schemes, corporate governance and strategy on climate change, performance in meeting GHG reduction targets, and risks and opportunities related to climate change impacts (Gallego-Alvarez et al., 2015; Nyahuna & Doorasamy, 2023). Increasing concern about environmental issues motivates researchers to separate environmental and social dimensions (Rokhmawati et al., 2015). This is so that investors may better comprehend their significance to a company's future, businesses measure and provide information about their environmental performance and impacts. In the face of unprecedented global challenges – climate change, water scarcity, and deforestation – disclosure is an

essential first step in addressing and reducing environmental impacts (Okudo & Amahalu, 2021).

Hardiyansah et al. (2021) described carbon disclosure as a process by which organisations measure and disclose their greenhouse gas (GHG) emissions and risks and opportunities associated with climate change. Financial Disclosures related to carbon emissions can be found in a company's sustainability or corporate social responsibility (CSR) report. These reports often include information about the company's greenhouse gas emissions, emission reduction efforts, and the financial aspect of those efforts (Hatta & Marietza, 2021). Carbon-related information may be disclosed in the company's annual environmental and sustainability reports. They may also be revealed through company websites or channels like the Carbon Disclosure Project (CDP, 2016).

2.1.2 Carbon emissions

Nyahuna and Doorasamy (2023) define carbon emissions disclosure as a comprehensive compilation of quantitative and qualitative data on a company's previous and future carbon emissions. Carbon emissions are carbon released into the atmosphere. According to Eco Life (2021), carbon emissions are linked to greenhouse gas emissions, the main contributors to climate change. Carbon emissions continue to increase from time to time at the global, regional, national, state, or local level due to the increasing use of energy from organic materials (fossil), land use change, and forest fires. Companies disclose their carbon emissions activities to help stakeholders and increase corporate transparency and accountability (Hatta & Marietza, 2021). However, the investigation of companies that disclose their carbon emission activities found that disclosing CO_2 emissions was costly and harmful to the company. The company considers the costs incurred only as additional costs, so many companies are still required to disclose their total CO_2 emissions.

2.1.3 Regulatory Framework for Carbon Disclosure

Acknowledging that climate change is a common concern of humankind, the Paris Agreement under the United Nations Framework Convention on Climate Change, also called the Paris Climate Agreement or COP21, which is an international treaty named after the city of Paris, France, was adopted in December 2015, and aimed at the reduction of the emission of gases the contribute to global warming (Bitanica & Raftery, 2019). The Paris Agreement is a global

framework to limit the rise in temperature to below 2.0 degrees Celsius and preferably to 1.5 degrees Celsius (Havikko, 2022).

It is the first universal and legally binding global climate change agreement. The core of the agreement is to limit greenhouse gas emissions. To reach this goal, the European Union (EU) aims to be climate-neutral by 2050 and to have net-zero greenhouse gas emissions (Haavikko, 2022). The Paris Agreement on climate change was signed in Nigeria at the 71st session of the United Nations General Assembly by former Nigerian president Muhammadu Buhari on September 22, 2016. By this agreement, Nigeria, in extension, has committed to reducing Greenhouse gas emissions unconditionally by 20 per cent and conditionally by 45 per cent, in line with Nigeria's nationally determined contributions without a definite roadmap to achieve this (Johnson, n.d.).

2.1.3.1 International Financial Reporting Standard (IFRS)

The International Sustainability Standard Board issued the International Financial Reporting Standard (IFRS) Sustainability Disclosure Standard, IFRS S1 & S2. The IFRS S1 sets out overall requirements to require an entity to disclose information about its sustainability-related risks and opportunities applicable to the primary users of general-purpose financial reports in making decisions relating to providing resources to the entity (Avi, 2022). The provided information about sustainability-related risks and opportunities holds significance for financial statement users due to the interconnectedness between an entity's capacity to generate cash flows in the short, medium, and long term and its interactions with stakeholders, society, the economy, and the natural environment across its value chain. For financial information associated with sustainability to be deemed beneficial, it must adhere to the essential qualitative attributes of a financial statement. Precisely, it must possess relevance and accurately reflect the intended representation.

The IFRS S2 sets out the requirement for identifying, measuring, and disclosing information about climate-related risk opportunities that are helpful to users of financial statements in making decisions relating to providing resources to the entity (Grajales Gaviria et al., 2023).

2.1.4 Carbon Savings

Carbon savings refer to reducing carbon emissions from adopting environmentally friendly practices compared to the baseline action. Baseline emissions serve as a crucial reference point for evaluating the effectiveness of efforts to reduce emissions (Hatta & Marietza, 2021). Carbon Savings are calculated by comparing the carbon emissions of a green action with its

respective baseline action: Carbon Savings = Carbon Emissions $_{Baseline}$ - Carbon Emissions $_{Green\ Actions}$ (Carbon Wallet, 2016).

2.1.5 Carbon Investment

Carbon investments are crucial in addressing climate change by supporting, developing and deploying low-carbon technologies, fostering innovation, and creating new markets and job opportunities. Carbon investing has also recently garnered interest from the public sector, including central banks that have expressed support for ways to help transition financial systems toward greener, low-carbon economies (Boffo & Patalano, 2020). Carbon investing aids in achieving global climate goals as outlined in the Paris Agreement 2016. It also addresses climate change's growing environmental, social, and economic risks. Strategically, carbon investing can be mitigated through climate-resilient infrastructure**,** and investing in infrastructure that can withstand climate-related risks is essential for minimising the impacts of climate change on communities and economies (Stein, 2023).

2.1.6 Financial Performance

Financial performance involves using company assets to produce income (Santos & Brito, 2012). Makori and Jagongo (2013), as well as Mohamed and Faouz (2014), argued that the level and quality of environmental accounting disclosure are influenced or determined by companies' financial attributes (such as profitability, leverage, liquidity, and long-term financing contribution). Financial performance is an effort made by every company to measure and assess every success achieved by analysing financial statements (Sukawati & Wahidahwati, 2020; Sukenti, 2022).

2.1.6.1 Social Return on Investment

Return on investment (ROI) is a conventional financial measure employed to assess the profitability of an investment. However, SROI is a framework used to understand, measure, and report the social, economic, and environmental value created by an intervention, programme, policy, or organisation (Gosselin et al., 2020). This SROI provides explicit guidance, enabling the measurement of social consequences that were previously difficult to assess and making them more accessible and quantifiable. The approach is rooted in conventional economic assessment and is acknowledged for its comprehensive framework encompassing the entirety of social effect and robust stakeholder involvement. The SROI offers an indication of the efficiency of an investment by comparing the value of its benefits to the value of the resources invested to assess comparative options (Gosselin et al., 2020). SROI is a systematic way of

incorporating the social values of different stakeholders into public sector decision-making on sustainability (Vluggen et al., 2020). SROI is a participatory, beneficiary-driven methodology that employs monetary values established by program beneficiaries to represent social, environmental, and economic results (Suryawati et al., 2023). SROI benefits management (such as policymakers and project managers) by developing organisational (or program) sustainability.

2.2 Theoretical Framework

This study adopted two complementary theories related to carbon disclosure and financial performance: the legitimacy theory and the stakeholder theory. These theories are selected to be appropriate for understanding companies' disclosure practices and financial performance. The study aims to ascertain the disclosure practices of Nigeria's selected manufacturing companies. The concern of the legitimacy theory is that firms should not just operate for financial gain alone but consider the environmental impact of their firms. Embracing adequate disclosure practices boosts their credibility and reputation in the environment in which they operate.

The stakeholder theory has been seen to have a relationship between firms' disclosure practices and the firm's financial performance. Also, as outlined by Freeman (1984), the stakeholder theory looks at how an organisation interacts with others in its internal and external settings; thereby, this theory further supports the need for firms to consider the interest of all parties affected by the firm's operation if, indeed, shareholders wealth must be maximised.

Therefore, the study proposed that the legitimacy and stakeholders theory are positively related to the performance of the listed firms. The selected theories possessed significant potential to explain the link between carbon-related disclosure and financial performance. These theories have been widely used by prior researchers, such as Olasupo and Akinselure (2017) and Worimegbe (2021), justifying the theories' relevance to this study.

2.3 Empirical Review

Rokhmawati et al. (2015) aimed to understand the impact of greenhouse gas emissions, Environmental Performance (EP), and Social Performance (SP) on the Financial Performance (FP) of listed manufacturing companies in Indonesia. Return on Investment (ROI) was used to determine the company's financial performance. The intensity of CO_2e was used to measure greenhouse gas emissions. The study used content analysis and panel regression. A dummy component of the proper score measured the fixed Environmental Performance (EP). Social

reporting scores created through content analysis were used to calculate company Social Performance (SP). Based on the findings from the study, ROI is positively and considerably impacted by CO_2e intensity and social reporting scores.

Though carbon emission costs (or carbon savings) are directly tied to the production process, existing costing methods only consider the total cost rather than the process of generating costs. Finding efficient ways to lower and manage carbon emission costs has become crucial for high-emission businesses, as they are being forced to deal with stricter carbon surveillance from carbon-related legislation and regulations. A study by Zhang et al. (2020) aimed to develop a carbon emission costing method based on carbon value flow analysis (CVFA) by simultaneously tracing carbon element flow and accounting for carbon emission monetary value. The paper also applies the rationality and efficacy of this approach inside a specific corporate setting to ascertain the rationality and efficacy of this approach. The findings suggest that implementing an optimal analysis reduced carbon emissions by 405,021.97 tonnes, leading to a cost savings of RMB 107,300,000 ($15,670,000). The suitability of the CVFA approach for process manufacturing firms has been demonstrated. Nevertheless, the application of CVFA necessitates specific conditions, including mandatory legislation on carbon information disclosure. Enhancing managers' ability to make informed decisions on investments in carbon resources can effectively decrease carbon emissions and result in significant cost savings.

Moreover, manufacturing companies have been identified as responsible for a more significant proportion of pollution worldwide, ranging from noise pollution, carbon emissions, improper waste disposal, and damage to social infrastructure such as roads, ground vibrations, and burst pipes. Government attempts to address the challenges of environmental degradation have yet to yield significant results, reflected in an increase in environmental degradation by manufacturing companies (Tiamiyu et al., 2021). Tiamiyu et al. (2021) examined Nigeria's Environmental Accounting Disclosure and Financial Performance of Listed Manufacturing Companies. The study examined how financial performance affects the environmental disclosures of manufacturing companies in Nigeria. The legitimacy theory supported the study. Data were collected from secondary sources. A panel regression model was adopted for data analysis. The results showed a positive significant association between financial performance and environmental disclosure.

Hatta and Marietza (2021) investigated the effect of disclosing carbon emissions on financial performance as measured by return on assets (ROA), return on equity (ROE), and return on

sales (ROS). Companies from the agriculture, mining, industrial (manufacturing), infrastructure, utility, and transportation sectors listed on the Indonesian Stock Exchange during the observation period of 2016–2018 make up the study's population. The study adopted a targeted sampling technique, and 27 companies were identified within three years, capturing 81 units of company observation from 2016-2018. The study results showed that carbon disclosure significantly impacts financial performance as measured by ROA, ROE and ROS.

More businesses are deciding to disclose carbon information, comply with national policies to decrease carbon emissions, and focus on corporate sustainable development to mitigate climate change risk in the context of low-carbon growth. Liu et al. (2021) investigated the impact of implementing carbon emission trading on corporate financial performance: evidence from listed companies in China. The study used a sample of Fortune 500 businesses to investigate how carbon disclosure affects financial performance using data from the 2011–2018 Carbon Disclosure Project (CDP) report. The study concluded that disclosure of carbon emissions could not materially improve the financial performance of carbon-intensive industries over the current period.

Njoku and Worimegbe (2023) assessed the level and significant difference between carbon disclosure and the financial performance of Multinational Companies (MNCs) in Nigeria. The study adopted the ex post facto research design based on the legitimacy theory, and a population of the ten multinational manufacturing companies listed on the Nigerian Exchange Group was used. The study also adopted the Task-force Climate Financial Disclosure (TCFD) to assess the disclosure practice of the companies over the years with a return on investment as the financial performance. The findings revealed that the disclosure practices of the companies were at a high standing as the number of companies that disclosed more was higher than those that disclosed less, which is in line with TCFD. Many of the companies appropriately disclosed the theme 'metric and target.' The study observed a significant difference between companies that disclose more and those that disclose less using the two-sample t-test statistic technique ($t= 17.35$; $p=0.0000$). The study further observed a significant statistical difference in the company's financial performance over the years ($F = 3.43$, $p = 0.0299$ for disclosed more and $F = 4.64$, $p = 0.0357$ for disclosed less). The study concluded that a significant difference exists in carbon disclosure practice with a corresponding significant difference in the financial performance of multinational companies in Nigeria from 2017-2022.

Eze and Akaegbobi (2023). This study investigated the influence of carbon management emissions on the financial performance of Nigeria's publicly traded oil and gas firms. The study

employed an ex post facto research design. The research was constrained to a sample of seven oil and gas companies chosen using the targeted sampling method. According to the Nigerian Exchange Group (NXG) website, the decision was made by categorising the companies as oil and gas companies, considering the nature and description of their activities. The data utilised in this study was obtained from annual reports and accounts of oil and gas samples collected in Nigeria. The research investigation revealed that carbon management exerts a robust and statistically significant influence on the operational outcomes of oil and gas enterprises operating in Nigeria. In summary, the findings validate the significance of carbon emissions management and environmental protection measures over immediate financial outcomes when evaluating a company's enduring worth.

3.0 METHODOLOGY

3.1 Research design

The *ex post facto* research design was adopted for this study. The nature of the research informed the choice of *ex-post facto* design. The possibilities for study have existed in the past, and the researcher can not influence the data.

3.2 Population of the Study

The study population comprises all ten (10) listed multinational manufacturing companies in Nigeria as of 2022 from the Nigerian Exchange Group.

3.3 Sample and Sampling Technique

The study employed the purposive sampling approach, which considered specific factors. The sampling criteria for this study encompass companies that have consistently published annual and sustainability reports from 2017 to 2022 while also clearly reporting carbon emissions following the Paris Agreement, which was signed in 2016. The study utilised a selection of seven international manufacturing corporations that satisfied preset criteria. These characteristics encompass:

i. The companies must have been listed and still in operation throughout the study.
ii. The companies must have the necessary data, such as carbon savings and carbon-related investment, stated in their yearly reports and accessible online.

Table 3.1 List of manufacturing companies and their various sectors

S/N	Company	Sector
1.	GlaxoSmithKline	Healthcare

2.	Guinness	Consumer goods
3.	Lafarge	Industrial goods
4.	May & Baker	Healthcare

Variables	Measurement	Authors
Carbon Savings	Metric tonnes values	Zhang, et al., 2020
Carbon-related Investment	Currency value	
Social Return on Investment	$\frac{\text{Net Income}}{\text{Carbon related Investment}} \times 100$	

5.	Nestlé	Consumer goods
6.	PZCussons	Consumer goods
7.	UACN	Conglomerate

3.4 Data and Sources of Data

The data employed in this study were gathered from secondary sources. The data in question were acquired from six (6) years, specifically from the annual reports and accounts of the selected firms spanning from 2017 to 2022. These firms have reported and adhered to the Paris Agreement, signed in 2016. Annual reports, sustainability reports, and other relevant documents were analysed to assess the extent of carbon-related financial disclosure practices. Financial statements, including statements of financial position and income statements, were collected to calculate financial performance indicators such as social return on investment and return on capital employed.

3.5 Measurement of Variables

Table 3.2 Measurement of variable

Source: Author's Design (2025)

3.6 Model specification

Y = f(X) ……(1)

Where Y = Dependent Variable – Financial Performance represented by Social Return on Investment

X = Independent variable - Carbon disclosure represented by Carbon savings and investment.

The study adapted a model from Nyahuna and Doorsamy (2023).

$FP_{it} = \beta 0 + \beta 1CCD_{it} + \beta 2SIZE_{it} + \beta 3LEV_{it} + \beta 4DEBR_{it}$

FPit is the financial performance measure that applies return on assets, return on equity, and net profit margin as the proxies for a company I at time n. CIDit is the score of carbon information disclosure.

Hence, the panel regression model for this study is defined as follows:

FP = F(CS,CRI)

Where;

SROI = Social Return on Investment

CS = Carbon Savings

CRI = Carbon-related investment

LOG = Logarithm

e = Error term

i = cross-sectional unit

t = time period

Therefore, the equation is written as follows;

Model 1

$SROI_{it} = \beta_0 + \beta_1 CS_{it} + \beta_2 CRI + e_{it}$ (i)

Rewritten in their logarithm form as;

$log SROI_{it} = \beta_0 + \beta_1 log CS_{it} + \beta_2 log CRI + e_{it}$ (ii)

3.7 A priori Expectation

The study's a priori expectation is that carbon disclosure affects social return on investment. This study aimed to contribute theoretically to the existing literature and general/developing knowledge on the benefit of disclosing carbon emissions in annual reports. It also supports and promotes mandatory disclosure of carbon emissions in financial statements. The findings could inform and reveal strategies and practices that lead to positive environmental responsibility and financial performance outcomes for regulatory agencies, investors, and corporate leaders.

3.8 Data Analytical Technique

The research employed panel data regression as the analytical approach. Panel data is a set of data comprising multiple cross-sectional data points from a specific period. The data analysis in this study was conducted using the Stata application programme and E-views to ascertain the significance level of each regression coefficient of the independent variable on the dependent variable.

4.0 RESULT AND DISCUSSIONS

4.1 Descriptive Analysis

The descriptive statistics entails the mean, maximum, minimum, and standard deviation of the number of observations per the study variable.

Table 4.1 Result of Descriptive Analysis

Variables	Obs	Mean	Std Dev.	Min	Max	Kurtosis	Skewness	Jarque Bera	Prob
LCS	42	9.79	1.17	6.99	11.78	2.27	-0.23	1.05	0.59
LCRI	42	13.34	0.64	11.51	14.46	3.82	-1.09	9.53	0.01
LSROI	42	6.63	1.54	3.80	9.50	1.90	0.20	2.39	0.30

Source: Author's compilation (2025)

In Table 4.1, the study also explores the statistical characteristics of the four variables related to this study: logged carbon savings (LCS), logged carbon-related investment (LCRI), logged return on investment (LSROI), and logged return on capital employed (LROCE). These variables have been transformed through logarithmic scaling, offering a nuanced perspective on their distributional patterns and statistical properties. The Logged Carbon Savings (LCS) mean stands at 9.91, with a relatively low standard deviation of 1.1. The range spans from 7.95 to 11.78, suggesting a moderate degree of variability. The kurtosis of 2.06 indicates a distribution with moderately heavy tails, while the skewness of -0.17 suggests a slight leftward asymmetry. The Jarque Bera test, with a probability of 0.41, indicates that the distribution may approximate normality.

Meanwhile, the Logged Carbon-Related Investment (LCRI) exhibits a mean of 6.43 and a standard deviation of 0.64. The range from 4.61 to 7.55 highlights a relatively narrow spread. The high positive kurtosis (3.82) indicates heavy tails, and the negative skewness (-1.09) points to a distribution skewed to the left. The Jarque Bera test, with a low probability of 0.01, signals potential non-normality in the distribution. Also, the Logged Social Return on Investment (LSROI) showcases a mean of -1.57 and a standard deviation of 0.73. The range from -3.21 to -0.02 suggests considerable variability. A positive kurtosis of 3.09 indicates heavy tails, while the skewness of -0.16 reflects a slight leftward skew. This means the distribution has a longer left tail, and the data is concentrated on the right side. The Jarque Bera test, with a probability of 0.27, suggests relative adherence to normality.

However, the Logged Return on Capital Employed (LROCE) has a mean of -2.06 and a standard deviation of 0.74. The range from -3.77 to 0.29 indicates substantial variability. A positive kurtosis of 4.39 indicates heavy tails, and the skewness of 0.73 suggests a rightward asymmetry, meaning that the distribution has a longer right tail, and the bulk of the data is concentrated on the left side. The Jarque Bera test, with a probability of 0.01, suggests some departure from normality. A Jarque-Bera test statistic of 10.16 with an associated p-value indicates that the data deviated from a normal distribution, as the p-value is likely low (below the chosen significance level of 0.05).

The Augmented Dickey-Fuller (ADF) method of unit root testing was employed in this study, and Table 4.2 shows the result of the ADF unit root test. The table below shows that all variables are stationary at level, given that their p-values are ≤ 0.05. Also, no lag length selection criteria were used. It is assumed that the lag length selection is automatic. Therefore, the null hypothesis is accepted.

Table 4.2 Unit root test

Variables integration	ADF statistics	P-values	Order of
LCS	- 5.65	0.01	I(0)
LCRI	- 4.30	0.01	I(0)
LSROI	- 3.74	0.03	I(0)

Source: Author's compilation (2025)

4.2 Correlation Analysis

In Table 4.3, the correlation of 0.06 suggests a weak positive relationship between carbon savings (LCS) and social return on investment (LSROI). This implies that an increase in carbon savings does not significantly impact the social return on investment. A possible explanation is that while reducing carbon emissions contributes positively to environmental sustainability, it may not directly translate into measurable social returns in financial or community-based terms. This implies that organisations investing in carbon savings might not see a strong immediate social return on investment. Other factors, such as policy incentives, corporate reputation, or direct social benefits, may influence LSROI more than carbon savings alone.

Table 4.3 Correlation Matrix of Carbon-related disclosure and financial performance

	LSROI	LCS	LCRI
LSROI	1		
LCS	0.06	1	
LCRI	-0.18	0.03	1

Source: Author's Compilation (2025)

However, the correlation of -0.18 suggests a weak inverse relationship between carbon investment (LCRI) and social return on investment (LSROI). This means that as investments in carbon reduction initiatives increase, the logged social return on investment tends to decrease slightly. A possible explanation is that carbon investments require significant upfront costs, and their benefits (especially regarding social impact) might take longer to materialise. This also implies that organisations prioritising carbon investments may face an initial reduction in social return due to high costs or delayed tangible benefits. To enhance environmental and social returns, policymakers and investors should consider complementary strategies, such as government incentives or stakeholder engagement.

In contrast, the correlation of 0.03 indicates virtually no relationship between carbon savings (LCS) and carbon investment (LCRI). This suggests that increased investments in carbon reduction do not necessarily lead to proportional increases in actual carbon savings. This could be due to inefficiencies in investment allocation, technology adoption delays, or external factors affecting carbon savings outcomes. This implies that Carbon investments do not automatically translate into immediate carbon savings. Hence, organisations must focus on investment efficiency, technological advancements, and effective carbon management strategies to bridge the gap between investment and actual savings.

4.3 Carbon-related Financial Disclosure (CRD) and Social Return on Investment (SROI)

The Hausman test was performed to identify the best regression and evaluate whether a random or fixed-effect regression model would be required. A P-value of 0.84, which is greater than the statistical p-value of 0.05, was shown by the Hausman test result in Table 4.4.

Table 4.4 Regression result for dependent variable Social Return on Investment

Variable		Social Return on Investment	
		Fe	Re
LCS	Coeff.	-0.18	-0.22
	S.E	0.22	0.21
	T	0.84	-1.04
	Prob.	0.41	0.30
LCRI	Coeff.	0.59	-0.68
	S.E	0.42	0.38
	T	-1.40	-1.78
	Prob.	0.17	0.08
Constant	Coeff.	16.27	17.89

	S.E	6.35	5.71
	T	2.56	3.13
	Prob.	0.02	0.00
	R-squared	0.10	
	F-stat	2.13	
	prob.>F	0.13	
	Durbin Watson	0.55	
Hausman	Prob.	0.84	

Source: Author's compilation (2025)

For the first hypothesis, the random effect model was therefore chosen. The following is a new formulation of the random effect regression equation for hypothesis one:

SROI = 17.89 - 0.22CS - 0.68CRI + e

The results indicate a positive relationship between carbon-related investments (CRI), savings (CS), and social return on investment. The coefficient of variation from the model provided in Table 4.4 indicates that the dependent variable, social return on investment (SROI), is 17.89 when all other variables are kept constant. The t-statistic values for all variables in Table 4.4 were found to be statistically nonsignificant, as they fell significantly below the "rule of thumb 2". Based on an R-squared value of 0.10, the regression coefficient estimates indicate that approximately 10% of the variances in the dependent variable may be explained by changes in the independent variable; this could also result from the weak correlation observed. Nevertheless, it is essential to note that the remaining proportion can be attributed to other variables not considered in this study. The Durbin-Watson statistic of 0.55 indicates a significant deviation from 2, suggesting the presence of negative autocorrelation. This is because the value falls below the commonly accepted threshold of 2, which is typically considered acceptable within the range of 1.5 to 2.5. Based on the obtained F-statistic value of 2.13, it may be concluded that the parameter estimations can be rejected at a significance level of 5% due to the F-statistic probability above 0.05. Here, the p-value is 0.13, above the standard significance level of 0.05. These findings indicate that the overall model lacks statistical significance. The null hypothesis is accepted for hypothesis one at a significance level of 5% because the likelihood of the F-statistic, which is 2.13, exceeds the threshold of 0.05.

4.3.1 Discussion of Findings

These findings indicate that the social return on investment of multinational corporations in the manufacturing sector is not influenced by carbon-related financial reporting. This may arise because investors in this industry give higher importance to other variables rather than environmental considerations when making investment choices. Manufacturing businesses can be assessed using criteria such as manufacturing efficiency, supply chain resilience, market demand for their products, or geopolitical considerations rather than merely relying on their carbon footprint or environmental disclosures. The results of this analysis align with the findings of Rokhmawati et al. (2015), who demonstrated a lack of statistical significance in the impact on financial performance.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study's objective was to investigate the effect of carbon disclosure on financial performance. The existing body of literature and relevant theories about CRD and its impact on financial performance were thoroughly examined and deliberated upon. This study's carbon disclosure and performance data were collected from secondary sources, including stand-alone annual reports and sustainability reports of seven multinational manufacturing companies in Nigeria. The data covered the period from 2017 to 2022. The Hausman test supported selecting the proper regression analysis in each panel analysis. Subsequently, the panel regression analysis was conducted, delineating the explicit outcomes. Based on the findings, it can be deduced that the impact of carbon-related financial disclosures on the return on investment was not statistically significant. Nevertheless, little positive association was observed between social return on investment (SROI) and carbon (CS) use.

5.2 Conclusion

The study determined a notable disparity in the carbon reporting behaviour of multinational corporations in Nigeria between 2017 and 2022. The panel analysis indicates that the carbon-related financial reporting of manufacturing enterprises did not positively impact their social return on investment used by manufacturing companies.

5.3 Recommendations

Based on the analysis of data and the findings, the study recommends the following:

i. It is recommended that companies explicitly disclose their carbon-related investment and carbon savings both in currency value and metric tons, respectively.

ii. Companies should improve their financial involvement in carbon-related activities to improve their financial performance.

5.4 Contribution to Knowledge

The study contributed to the literature by using carbon savings in metric tonnes and currency and carbon investments as measures for carbon-related disclosure and social return on investment as a financial performance measure in addition to the frequently used return on capital employed as against the model adapted from Nyahuna and Doorsamy (2023).

5.5 Suggestions for further studies

Following the recent disbandment of the TCFD framework taken over by the IFRS S1 and S2, it is suggested that further research should be carried out in line with the requirements of the IFRS S1 and S2. Further research can use moderating or controlling variables affecting carbon-related disclosure and financial performance.

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APPENDICES
HAUSMAN RESULTS

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.341240	2	0.8431

** WARNING: estimated period random effects variance is zero.

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LCS	-0.184718	-0.218452	0.004542	0.6167
LCRI	-0.587168	-0.683819	0.028225	0.5651

Dependent Variable: LSROI
Method: Panel EGLS (Period random effects)
Date: 03/10/24 Time: 10:56
Sample: 2017 2022
Periods included: 6
Cross-sections included: 7
Total panel (balanced) observations: 42
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17.88921	5.713062	3.131281	0.0033
LCS	-0.218452	0.210000	-1.040247	0.3046
LCRI	-0.683819	0.383424	-1.783455	0.0823

Effects Specification

	S.D.	Rho
Period random	0.000000	0.0000
Idiosyncratic random	1.566830	1.0000

Weighted Statistics

R-squared	0.098448	Mean dependent var	6.629195
Adjusted R-squared	0.052214	S.D. dependent var	1.543712
S.E. of regression	1.502870	Sum squared resid	88.08606
F-statistic	2.129366	Durbin-Watson stat	0.554332
Prob(F-statistic)	0.132532		

Unweighted Statistics

R-squared	0.098448	Mean dependent var	6.629195
Sum squared resid	88.08606	Durbin-Watson stat	0.554332

Dependent Variable: LSROI
Method: Panel Least Squares
Date: 03/10/24 Time: 10:57
Sample: 2017 2022
Periods included: 6
Cross-sections included: 7
Total panel (balanced) observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.26974	6.350365	2.562017	0.0150
LCS	-0.184718	0.220549	-0.837536	0.4081
LCRI	-0.587168	0.418615	-1.402644	0.1698

Effects Specification

Period fixed (dummy variables)

R-squared	0.145708	Mean dependent var	6.629195
Adjusted R-squared	-0.030176	S.D. dependent var	1.543712
S.E. of regression	1.566830	Akaike info criterion	3.905630
Sum squared resid	83.46856	Schwarz criterion	4.236614
Log likelihood	-74.01823	Hannan-Quinn criter.	4.026949
F-statistic	0.828431	Durbin-Watson stat	0.516908
Prob(F-statistic)	0.571032		

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.095312	2	0.9535

** WARNING: estimated period random effects variance is zero.

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LCS	-0.242457	-0.243793	0.001310	0.9706
LCRI	0.060137	0.075776	0.008140	0.8624

UNIT ROOT RESULTS
SROI

Augmented Dickey-Fuller Test

data: Panel_dataset$SROI
Dickey-Fuller = -3.7411, Lag order = 1, p-value = 0.03388
alternative hypothesis: stationary

LCRI

Augmented Dickey-Fuller Test

data: pdata$CRI

Dickey-Fuller = -4.301, Lag order = 1, p-value = 0.01
alternative hypothesis: stationary

LCS

Augmented Dickey-Fuller Test

data: pdata$CS
Dickey-Fuller = -5.6494, Lag order = 1, p-value = 0.01
alternative hypothesis: stationary

IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON SUSTAINABLE RISK MANAGEMENT PRACTICES IN MANUFACTURING FIRMS IN EKITI STATE, NIGERIA

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ABSTRACT

In an era of rapid technological evolution, Artificial Intelligence (AI) has emerged as a transformative force in redefining risk management, particularly in the manufacturing sector. This study examines the impact of AI on sustainable risk management practices in manufacturing firms in Ekiti State, Nigeria. Specifically, it explores how AI enhances risk identification, improves risk assessment accuracy, and strengthens risk control mechanisms for operational stability. A descriptive survey research design was adopted, targeting employees of selected manufacturing firms in Ekiti State. Using the Taro Yamane model, 127 respondents were selected. Data was collected through a validated questionnaire and analyzed using descriptive statistics, while simple linear regression and Pearson correlation were employed to test the hypotheses. Findings reveal that AI significantly enhances risk identification, allowing early detection of operational vulnerabilities (coefficient = 0.684, p=0.000<0.05). AI-powered risk assessment tools improve predictive analytics and decision-making (coefficient = 0.590, p=0.000<0.05). Additionally, AI-driven risk control strategies enhance operational resilience (coefficient = 0.620, p=0.000<0.05). These results suggest that AI adoption is essential for mitigating risks and ensuring the long-term sustainability of manufacturing firms. The study concludes that AI is a critical driver of effective risk management. It is recommended that manufacturing firms should invest in AI-driven predictive models, machine learning algorithms, and real-time monitoring systems to improve risk management efficiency.

Keywords: Artificial Intelligence, Risk Management, Sustainable Practices, Risk Identification, Risk Control, Operational Resilience.

1.0. INTRODUCTION

1.1 Background

The rapid advancement of technology has transformed various sectors, including manufacturing, by introducing innovative solutions to complex challenges. Among these technological advancements, artificial intelligence (AI) has emerged as a significant tool for enhancing operational efficiency, improving decision-making, and optimizing risk management strategies (Adeleke & Amusa, 2021). AI applications such as machine learning, predictive analytics, and robotic process automation (RPA) have revolutionized traditional risk management approaches, enabling organizations to identify, assess, and mitigate risks proactively (Adeoye & Elegbede, 2022).

Akinyemi and Adebayo (2021) asserted that AI is the science of designing systems that replicate human-like cognitive abilities, enabling machines to learn from data, recognize patterns, and make informed decisions with minimal human intervention. It functions as a bridge between raw information and intelligent action, transforming static inputs into dynamic insights through algorithms, predictive modeling, and automation. AI is not just about mimicking human thought but about enhancing it optimizing processes, uncovering hidden correlations, and evolving with every interaction to redefine efficiency and innovation across industries (Ajayi, Ogundele & Bamgbose, 2022). The manufacturing sector in Nigeria is a critical component of the country's economy. However, the industry faces numerous risks, including supply chain disruptions, financial volatility, regulatory uncertainties, cyber threats, and environmental concerns. Traditional risk management methods, which often rely on manual processes and historical data, have proven inadequate in addressing these dynamic and evolving risks (Agarwal & Narain, 2021). AI-driven risk management provides a data-driven, automated, and predictive approach that can enhance decision-making and sustainability in the manufacturing industry.

Sustainable risk management practices are forward-thinking strategies that balance risk mitigation with long-term resilience, ensuring that businesses navigate uncertainties without compromising future growth, environmental integrity, or societal well-being (Amulya & Johny, 2021). Rather than merely reacting to threats, these practices integrate predictive intelligence, ethical governance, and adaptive decision-making to create a risk-aware ecosystem where financial stability, regulatory compliance, and sustainability coexist (Zainal, 2017). It is not just about avoiding pitfalls it is about building a foundation where risks become catalysts for innovation, resilience, and enduring value creation (Kim, Lee & Kang, 2020). Aven (2016) noted that sustainable risk management practices focus on ensuring long-term business resilience while considering environmental, social, and governance (ESG) factors. Nigerian manufacturing firms mostly in Ekiti State operate in an environment where sustainability challenges, such as environmental pollution, resource scarcity, and regulatory compliance, are becoming increasingly significant (Adebisi, Okonji, Adeeyo & Ezebuiro, 2023). AI-powered solutions, such as real-time monitoring systems, predictive maintenance, and automated risk assessment models, offer the potential to enhance sustainability by reducing waste, optimizing resource usage, and improving regulatory compliance. AI is revolutionizing sustainable risk management in manufacturing by shifting it from a reactive process to a proactive strategy (Amaechi, Amaechi & Adeyemo, 2017). Through predictive analytics, real-time monitoring, and

automation, AI enhances risk identification, minimizes disruptions, and optimizes resource efficiency. It strengthens cybersecurity, ensures regulatory compliance, and enables data-driven decision-making, turning risk management into a competitive advantage. By integrating AI, manufacturing firms not only mitigate threats but also enhance sustainability, resilience, and long-term operational success (Alzeaideen, 2019). Despite the evident benefits of AI in risk management, Nigerian manufacturing firms face several barriers to AI adoption, including high implementation costs, lack of skilled workforce, data privacy concerns, and resistance to change. Additionally, the lack of adequate infrastructure and regulatory frameworks further hampers the integration of AI into risk management practices. Given these challenges, it is imperative to explore the impact of AI on sustainable risk management practices in manufacturing firms Ekiti State, Nigeria.

1.2 Statement of the Problem

The Nigerian manufacturing sector is fraught with numerous risks, including fluctuating raw material prices, supply chain disruptions, regulatory changes, financial uncertainties, and environmental hazards (Nwankwo, 2023). Traditional risk management approaches often rely on historical data and reactive strategies, which limit their effectiveness in mitigating emerging risks. The increasing complexity and unpredictability of the manufacturing environment necessitate more advanced and proactive risk management solutions (Aven, 2016). Adeyemi (2022) presented that artificial intelligence presents a transformative opportunity for risk management by offering real-time data analytics, predictive modeling, and automated decision-making capabilities. AI-driven risk management systems can identify potential threats before they escalate, optimize risk mitigation strategies, and improve overall operational efficiency. However, the adoption of AI in Nigerian manufacturing firms remains limited due to several challenges, including financial constraints, lack of technical expertise, and concerns about data security and ethical implications (Deloitte, 2022). Additionally, while global manufacturing firms have successfully integrated AI-driven risk management practices to enhance sustainability, Nigerian manufacturing firms still struggle with issues such as environmental pollution, inefficient resource utilization, and non-compliance with regulatory standards (Adeyemo, Olusola & Bisi, 2022). AI technologies such as machine learning, IoT-enabled monitoring, and blockchain-based risk management have the potential to address these sustainability challenges, yet their adoption in Nigeria remains relatively unexplored. This study seeks to fill the existing knowledge gap by investigating the impact of AI on sustainable risk management

practices in Nigerian manufacturing firms. It aims to assess how AI improves risk identification, assessment, and control in Nigeria's manufacturing sector, offering strategic insights into its role in sustainability and efficiency. Specifically, it seeks to answer:

i. How does AI transform the way risks are identified within the Nigerian manufacturing industry?
ii. In what ways does AI enhance risk assessment within the Nigerian manufacturing industry?
iii. How does AI revolutionize risk control mechanisms within the Nigerian manufacturing industry?

2.0. CRITICAL REVIEW OF THE LITERATURE

2.1. Review of Key Concepts

2.1.1. Artificial Intelligence (AI)

According to Eze and Chinedu (2020), artificial intelligence is more than just a technological breakthrough; it is the fusion of human-like cognition with computational precision, enabling machines to learn, adapt, and make intelligent decisions. At its core, AI is not about replacing human thought but amplifying it transforming raw data into strategic foresight, automating complex processes, and redefining how industries function. Unlike traditional computing, which follows rigid programming rules, AI thrives on flexibility, evolving with every interaction to improve accuracy and efficiency (Nwanko, 2023). Adeyemi (2022), portrayed that the concept of AI extends beyond algorithms and automation; it represents a paradigm shift in problem-solving, where machines anticipate needs, detect patterns, and optimize operations without constant human intervention. Machine learning, neural networks, and natural language processing empower AI to interpret information, recognize trends, and even predict future scenarios. Whether in manufacturing, healthcare, finance, or everyday applications, AI is not just a tool but an evolving intelligence one that continuously reshapes industries, enhances decision-making, and drives innovation at a pace never seen before (Obi & Kalu, 2021). AI is the digital embodiment of learning and adaptation; a technology designed to replicate and enhance human intelligence through data-driven reasoning. It is not merely a collection of algorithms but an evolving system that absorbs information detects patterns, and refines its responses over time (Obafemi & Johnson, 2023). AI's true power lies in its ability to not only respond to challenges but to anticipate them, shifting industries from reactive approaches to

proactive, intelligent strategies. As it continues to evolve, AI is not just changing how work is done it is redefining what is possible (Nwogugu, 2023).

2.1.2. Sustainable Risk Management Practices

Alaba (2018) posited that sustainable risk management practices go beyond conventional risk mitigation they embody a forward-thinking approach that balances resilience, adaptability, and long-term value creation. It is not just about preventing losses; it is about integrating risk awareness into the fabric of decision-making, ensuring that businesses can navigate uncertainties while remaining financially stable, environmentally responsible, and socially accountable (Adedokun & Egbelakin, 2024). As described by Kassem (2022), sustainable risk management is an evolving framework where risks are not merely controlled but strategically leveraged to drive innovation and strengthen organizational agility. By incorporating predictive analytics, ethical governance, and proactive planning, it transforms risk from a potential disruption into a structured opportunity for growth. It aligns financial stability with sustainability goals, ensuring that every risk response contributes to long-term success rather than short-term fixes (Olawumi & Chan, 2019). In an era of constant change, sustainable risk management is not just a safeguard it is a blueprint for thriving in an unpredictable world (Rawat, Gupta & Rao, 2023).

Suda and Dey (2015), affirmed that sustainable risk management practices represent a dynamic approach to identifying, assessing, and mitigating risks in a way that ensures long-term stability, environmental responsibility, and ethical business conduct. Its essence, it is a balancing act aligning financial prudence with sustainability, regulatory compliance with innovation, and short-term efficiency with long-term impact. It embraces predictive intelligence, data-driven insights, and strategic foresight to create a risk-aware culture where businesses do not just survive uncertainty but use it as a catalyst for transformation. In this way, sustainable risk management is not merely about avoiding crises it is about building a future where risks become stepping stones to innovation, sustainability, and enduring success (Olawumi & Chan, 2019). This study explores sustainable risk management as a comprehensive framework that seamlessly weaves together risk identification, assessment, and control creating a resilient foundation for strategic foresight and enduring stability.

2.1.2.1. Risk Identification

Rimsait (2019), described risk identification as the foundational pillar of effective risk management, acting as the lens through which potential threats and uncertainties come into focus. It is not merely about recognizing dangers it is a strategic process of uncovering vulnerabilities, mapping out potential disruptions, and anticipating challenges before they manifest. By systematically analyzing internal operations, external environments, and emerging trends, risk identification transforms uncertainty from a blind spot into a well-defined roadmap for preparedness (Tang, Ji, Zheng, Liu, Ma & Chen, 2023). At its core, the concept of risk identification extends beyond detection; it is about understanding the nature, scope, and impact of risks in a way that empowers proactive decision-making. Whether through data analytics, scenario analysis, or industry expertise, it ensures that risks are not only acknowledged but also classified, prioritized, and addressed in alignment with an organization's goals. In a constantly evolving world, risk identification is not just a defensive mechanism it is an essential blueprint for resilience, innovation, and sustainable success (Kassem, 2022).

2.1.2.2. Risk Assessment

Risk assessment is the bridge between uncertainty and strategic action, transforming vague threats into measurable insights. It is not just about acknowledging risks but about dissecting them quantifying their likelihood, analyzing their potential impact, and prioritizing them based on their significance (Kikwasi, 2018). This process turns risk from an abstract concept into a structured analysis, allowing businesses to make informed decisions rather than reactive guesses. At its essence, risk assessment is the science of foresight, where data, expertise, and predictive models converge to paint a clear picture of potential disruptions (Lima & Milner, 2016). It enables organizations to differentiate between critical threats and manageable uncertainties, ensuring that resources are allocated efficiently to safeguard operations. In an ever-changing world, risk assessment is more than a precaution it is a strategic tool that empowers businesses to navigate complexity with confidence and clarity (Olawumi & Chan, 2019).

2.1.2.3. Risk Control

According to Rodhi, Anwar, and Wiguna (2017), risk control is where strategy meets execution, transforming risk management from theory into action. It is not just about minimizing threats but about designing proactive measures that strengthen resilience, ensuring that identified risks do not escalate into operational crises. Risk control operates as a safeguard, embedding

preventive mechanisms, contingency plans, and adaptive strategies into an organization's framework to neutralize uncertainties before they materialize (Suda & Dey, 2015). At its core, risk control is a dynamic, ongoing process one that evolves alongside emerging threats and shifting business landscapes. It combines policy enforcement, technological interventions, and human expertise to create a multi-layered defense against disruptions. More than a defensive tactic, risk control fosters a culture of preparedness, ensuring that organizations do not merely react to risks but are equipped to outmaneuver them. In this way, risk control is not just about protection it is about positioning businesses to thrive, even in the face of uncertainty (Alaba, 2018).

2.2. Review of Theoretical Perspectives

2.2.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), serves as a theoretical foundation for understanding how individuals and organizations adopt and integrate new technologies. At its core, TAM posits that the decision to embrace technology is primarily driven by two key perceptions: Perceived Usefulness (PU) and Perceived Ease of Use (PEU). These factors shape users' attitudes, influence their behavioral intentions, and ultimately determine the extent to which a technology is adopted in practice (Venkatesh & Davis, 2000). In the context of artificial intelligence (AI) in sustainable risk management, TAM provides a lens through which the adoption of AI-driven risk assessment and mitigation strategies can be understood. Manufacturers navigating an increasingly complex and uncertain business environment must make critical decisions about integrating AI into their risk management frameworks. While AI offers sophisticated capabilities such as predictive analytics, real-time monitoring, and automated decision-making, its adoption depends on whether industry professionals perceive it as valuable and user-friendly (Gefen & Straub, 1997). One of the primary considerations in AI adoption is perceived usefulness (PU) the extent to which users believe that AI enhances their ability to identify, assess, and control risks. AI-powered risk management tools can analyze vast datasets, detect anomalies, and generate risk predictions with greater accuracy than traditional methods. When manufacturing firms recognize that AI improves risk resilience, enhances operational efficiency, and ensures regulatory compliance, they are more likely to integrate it into their processes (Davis, Bagozzi, & Warshaw, 1989). However, if AI is perceived as unreliable or too complex, adoption rates may be significantly lower (Venkatesh et al., 2003). Similarly, perceived ease of use (PEU) plays a crucial role in

determining whether AI technologies are readily embraced. If AI-driven risk management systems are intuitive, require minimal training, and seamlessly integrate with existing workflows, firms will be more inclined to adopt them (Venkatesh & Bala, 2008).

On the other hand, if AI systems are perceived as technically demanding, disruptive to traditional workflows, or difficult to interpret, organizations may resist implementation despite acknowledging their benefits (Chau & Hu, 2001). Understanding AI adoption through TAM is particularly relevant when examining its role in sustainable risk management, which comprises three critical components: risk identification, risk assessment, and risk control.

- Risk Identification: AI can proactively detect vulnerabilities by analyzing historical data and identifying potential risks before they escalate (Siau & Shen, 2003). However, manufacturing firms must perceive AI as a trustworthy and indispensable tool in risk identification for it to be widely adopted.

- Risk Assessment: AI-powered systems provide advanced risk quantification, measuring the likelihood and potential impact of various threats with greater precision (Sun & Zhang, 2006). The extent to which firms believe that AI enhances risk assessment accuracy directly influences their willingness to integrate it.

- Risk Control: AI automates risk mitigation strategies, offering real-time solutions and adaptive responses to emerging threats (Lu et al., 2019). If manufacturers perceive AI-driven control mechanisms as efficient, adaptable, and easy to monitor, they are more likely to embed AI into their long-term risk management strategies.

Applying TAM to AI adoption in sustainable risk management helps uncover both the drivers and barriers influencing technology adoption within the Nigerian manufacturing sector. By assessing how manufacturers perceive the usefulness and ease of AI tools, this study provides insights into the factors that encourage or hinder AI integration. Furthermore, this study highlights the need for user-centric AI design, where technology developers must ensure that AI solutions are not only powerful but also accessible and intuitive. Understanding perception-based adoption barriers can guide policymakers, industry leaders, and technology providers in fostering AI acceptance and implementation (Venkatesh et al., 2012). Ultimately, TAM serves as a bridge between AI's potential and its real-world application. If Nigerian manufacturers recognize AI as an essential tool for proactive risk management, operational efficiency, and

long-term sustainability, they are more likely to embrace it as an integral part of their strategic framework (Davis, 1989). This study, therefore, leverages TAM to explore how AI adoption can revolutionize risk management, ensuring that firms move beyond traditional reactive models toward data-driven, AI-powered resilience in an ever-evolving business landscape.

2.3. Empirical Evidence Analysis on AI and Sustainable Risk Management Practices

AI has emerged as a transformative force across multiple industries, offering innovative solutions for risk management, business growth, supply chain resilience, and sustainability. Researchers have extensively explored AI's impact, revealing its dual nature providing substantial benefits while also introducing new risks and challenges that require careful regulation and management. Žigiene, Rybakovas, and Alzbutas (2019) conceptualized a commercial risk assessment framework integrating AI elements, drawing insights from scientific literature, policy documents, and risk management standards. Their study outlines the primary components of commercial risk categories, data sources, and workflow phases, providing recommendations for business enterprises, policymakers, and academic researchers on how to enhance and implement AI-driven risk management frameworks. AI's economic influence extends to small businesses, as Bandari (2019) empirically investigated its role in revenue growth within developing nations. Utilizing multiple regression analysis on data from 391 small enterprises, the study found that AI-driven customer service, marketing, sales forecasting, inventory management, financial planning, and lead generation significantly contributed to revenue growth. However, AI-based employee management and cybersecurity were not found to have a statistically significant impact. Beyond financial growth, AI has also played a pivotal role in corporate sustainability. Zhao and Fariñas (2022) explored AI's role in addressing sustainability challenges, emphasizing that while AI can drive innovation and efficiency, it also presents ethical risks such as algorithmic bias and unintended environmental consequences. The study advocates for a proactive regulatory framework supported by corporate policies to ensure AI remains a force for the common good rather than a destabilizing threat. In the realm of supply chains, AI enables firms to navigate volatility and optimize decision-making. Wong, Tan, Ooi, Lin, and Dwivedi (2022) examined how AI enhances supply chain agility and re-engineering capabilities, allowing small and medium enterprises (SMEs) to adapt to fluctuating market conditions. Their research utilized partial least squares-based structural equation modeling (PLS-SEM) and artificial neural networks (ANN) to demonstrate how AI-driven risk management significantly improves supply chain resilience and decision-making.

Yulia and Wamba (2022) further explored AI's role in supply chain resilience, particularly in European firms. Their study conceptualized AI as a dynamic information processing capability with three core components: coordination and integration, learning, and strategic response. The findings revealed that AI directly strengthens business resilience, with firm resilience fully mediating the link between AI adoption and overall business performance. In the digital marketing space, AI and e-commerce have revolutionized SME operations. Kumar, Pandey, Pujari, and Arora (2023) conducted a literature-based study on AI's contribution to SME marketing performance, uncovering advancements in predictive modeling, automated decision-making, real-time customer insights, and innovative business models. AI adoption has also improved demand forecasting, optimized promotional strategies, and enhanced customer engagement. Lian (2023) examined the factors influencing digital technology adoption in green supply chain innovation within Malaysian social enterprises. Through a survey of 410 firms and structural equation modeling, the study identified performance expectancy, effort expectancy, and cost considerations as significant determinants of digital technology adoption, shaping sustainable business practices. AI's integration into the banking sector has also been the subject of comparative analysis. Nnaomah et al. (2024) reviewed AI's application in risk management within banks in the United States and Nigeria. Their findings indicate that U.S. banks have advanced AI-driven risk management tools, including machine learning models and natural language processing for fraud detection and compliance monitoring.

Nigerian banks, on the other hand, are in the early stages of AI adoption, hindered by technological limitations, regulatory challenges, and a lack of skilled personnel. Nonetheless, the growing awareness of AI's value in mitigating risks and enhancing competitiveness signals potential for future growth. Similarly, Ononiwu et al. (2024) focused on operational risk management (ORM) practices in Nigerian banks, highlighting the challenges posed by regulatory pressures, economic instability, and cybersecurity threats. While traditional and modern risk management frameworks exist, governance gaps and technological deficiencies persist. The study emphasizes the need for improved corporate governance, cross-functional collaboration, and advanced AI technologies to fortify ORM systems and ensure long-term financial stability. Beyond financial and operational risk management, AI plays a crucial role in sustainable manufacturing. Schneider et al. (2024) introduced a methodology integrating Life Cycle Assessment (LCA) with Failure Mode and Effects Analysis (FMEA) to assess environmental risks in manufacturing, aligning with the Corporate Sustainability Reporting Directive (CSRD) and European Sustainability Reporting Standards (ESRS). Their study

proposes a bottom-up approach for evaluating sustainability risks, ensuring that manufacturers can adapt to regulatory changes and market demands effectively.

3.0. METHOD

3.1. Research Design and Methods

This study employs a descriptive survey methodology to unravel the profound influence of Artificial Intelligence (AI) on sustainable risk management within manufacturing firms in Ekiti State, Nigeria. A targeted sample of 127 senior staff members drawn exclusively from 10 registered manufacturing firms namely Warm Spring Water Nig Ltd, Vicolas Group, Warm Springs Ltd, Dabco Steels Nig Ltd, Ige Pharmacy Nig Ltd, Green World International, Da-segjohn Nig Ltd, Kitwood and Sons, Ramkay Industries Ltd and TechHead Nigeria. This is to ensures a wealth of expert insights guided by the Taro Yamane model and ensures diverse and representative perspectives from industry professionals. The research instruments a structured questionnaire was meticulously designed with three sections: demographic profiling, AI integration, and risk management practices. To quantify perceptions, a 5-point Likert scale was employed, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), capturing the depth of respondents' perspectives. Data underwent rigorous analysis using descriptive statistics and simple linear regression modeling via the Statistical Package for Social Sciences (SPSS). The study's regression equations, foundational to understanding AI's role in risk management, are structured as follows:

$RI = \beta_0 + \beta_1 AII + \varepsilon$……(i)

$RA = \beta_0 + \beta_1 AII + \varepsilon$……..(ii)

$RC = \beta_0 + \beta_1 AII + \varepsilon$……..(iii)

Where:

AI represents Artificial Intelligence

RI, RA, and RC denote Risk Identification, Risk Assessment, and Risk Control

β_0 is the regression constant

β_1 signifies the coefficient of the independent variable

ε captures the error term

4.0. STATISTICAL ANALYSIS AND DISCUSSION

4.1. Results

Out of the 127 questionnaires distributed, 118 were completed and returned, resulting in a response rate of 92.9%. Therefore, the analysis was based on the feedback provided by these respondents.

Table 4.1: Distribution of Demographic Profile of the Respondents

Gender	**Freq**	**%**
Female	20	16.9
Male	98	81.3
Total	118	100.0
Age	**Freq**	**%**
20-29	9	7.6
30-39	60	50.8
40-49	38	32.2
50 and Above	11	9.3
Total	118	100.0
Marital Status	**Freq**	**%**
Single	29	24.6
Married	66	55.9
Divorced	17	14.4
Widow	6	5.1
Total	118	100.0
Educational Qualification	**Freq**	**%**
Below First Degree	64	54.2
First Degree	43	36.4
Master Degree	11	9.3
Total	118	100.0
Years of Experience	**Freq**	**%**
1-5	33	28.0
6-10	58	49.2
11-15	13	11.0
16 and Above	14	11.9
Total	118	100.0

Source: Empirical Data Collection (2025)

The respondent demographics reveal that out of 118 participants, 20 individuals (16.9%) identified as female, whereas the majority, 98 respondents (81.3%), were male. This accounts for the total survey population of 118 (100.0%). Examining the age distribution, 9 respondents (7.6%) fell within the 20-29 age bracket, while the highest proportion, 60 respondents (50.8%), were between 30-39 years old. Additionally, 38 participants (32.2%) were aged 40-49, and the remaining 11 respondents (9.3%) were 50 years and above. Concerning marital status, 29 respondents (24.6%) reported being single, while 66 participants (55.9%) were married. Meanwhile, 17 individuals (14.4%) identified as divorced, and 6 respondents (5.1%) were widowed. Altogether, this sums up to the total respondent count of 118 (100.0%).

The educational background of respondents varied, with 64 individuals (54.2%) holding a Higher National Diploma (HND), 43 respondents (36.4%) possessing a first degree, and 11 participants (9.3%) having attained a master's degree. This brings the overall count to 118 (100.0%). Regarding work experience, 33 respondents (28.0%) had been employed for 1-5 years, while 58 participants (49.2%) had between 6-10 years of experience. Meanwhile, 13 individuals (11.0%) had worked for 11-15 years, and the remaining 14 respondents (11.9%) had accumulated 16 years or more of professional experience. The total survey sample remains 118 (100.0%).

4.2. Research Hypothesis Evaluation

Hypothesis 1: There is no significant relationship between AI and sustainable risk management practices (Risk Identification) in manufacturing firms in Ekiti State, Nigeria.

Table 4.2: Regression Analysis for Risk Identification

Variables	Coefficient	Std Error	T-Stat	Prob.
C	2.462	.633	3.890	0.000
Artificial Intelligence (AI)	0.684	.030	22.892	0.000
R: 0.905, R-square: 0.819, F-stat: 524.039, Sig.; 0.000				

Source: ***Statistical Analysis Report***

Table 4.2 reveals a correlation coefficient (R) of 0.905, suggesting a substantial link between AI adoption and risk identification in manufacturing firms in Ekiti State, Nigeria. The coefficient of determination (R^2) is 0.819, meaning that AI adoption is responsible for 82% of the observed variations in risk identification, while the remaining 18% is shaped by external influences beyond this model. The statistical evidence further establishes that AI adoption significantly enhances risk identification, as indicated by a coefficient of 0.684 and a p-value of 0.000. This strong significance leads to the rejection of the null hypothesis, affirming the alternative hypothesis.

In practical terms, every 1% increase in AI adoption corresponds to a projected 68% improvement in risk identification capabilities among manufacturing firms in Ekiti State. Additionally, the F-statistical probability of 0.000 underscores the credibility of this regression analysis, confirming that the findings are statistically significant at the 5% level of confidence.

Hypothesis 2: There is no significant relationship between AI and sustainable risk management practices (Risk Assessment) in manufacturing firms in Ekiti State, Nigeria.

Table 4.3: Regression Analysis for Risk Assessment

Variables	Coefficient	Std Error	T-Stat	Prob.

C	5.667	.684	8.285	0.000
Artificial Intelligence (AI)	0.590	.032	18.282	0.000
R: 0.862, R-square: 0.742, F-stat: 334.242.039, Sig.; 0.000				

Source: *Statistical Analysis Report*

AI adoption demonstrates a strong influence on risk assessment in manufacturing firms in Ekiti State, Nigeria, as reflected by a correlation coefficient (R) of 0.862. This signifies a significant connection between the two variables. The coefficient of determination (R^2) stands at 0.742, indicating that 74% of the variations in risk assessment can be attributed to AI adoption, while the remaining 26% is shaped by external influences beyond the scope of this model.

The statistical analysis further confirms that AI adoption exerts a meaningful and positive impact on risk assessment. This is supported by a coefficient of 0.590 and a p-value of 0.000, reinforcing the rejection of the null hypothesis in favor of the alternative hypothesis. In quantitative terms, a 1% rise in AI adoption is expected to drive a 59% increase in risk assessment efficiency within these firms. The F-statistical probability of 0.000 further validates the reliability of the regression model, underscoring its statistical significance at the 5% confidence level used in this study.

Hypothesis 3: There is no significant relationship between AI and sustainable risk management practices (Risk Control) in manufacturing firms in Ekiti State, Nigeria.

Table 4.4: Regression Analysis for Risk Control

Variables	Coefficient	Std Error	T-Stat	Prob.
C	4.831	.904	5.341	0.000
Artificial Intelligence (AI)	0.620	.043	14.513	0.000
R: 0.803, R-square: 0.645, F-stat: 210.622.039, Sig.; 0.000				

Source: *Statistical Analysis Report*

The impact of AI adoption on risk control in manufacturing firms in Ekiti State, Nigeria, is evident through a correlation coefficient (R) of 0.803, highlighting a substantial relationship between the two variables. With a coefficient of determination (R^2) of 0.645, the findings suggest that AI adoption explains 65% of the variations in risk control, while the remaining 35% is attributed to factors beyond the model's scope. The statistical results further affirm AI's significant role in strengthening risk control measures. A coefficient of 0.620, coupled with a p-value of 0.000, confirms the robustness of this effect, leading to the rejection of the null hypothesis and the acceptance of the alternative. In real-world applications, every 1% increase in AI adoption translates into an estimated 62% improvement in risk control strategies among these firms. Additionally, the F-statistical probability of 0.000 reinforces the credibility of the

regression model, validating its statistical significance at the 5% confidence level established for this study.

4.3. Discussion

This study has undertaken an in-depth analysis of the impact of AI adoption on sustainable risk management practices in manufacturing firms in Ekiti State, Nigeria. Using simple linear regression, the study tested the formulated hypotheses and provided empirical evidence on the relationship between AI adoption and the key dimensions of risk management: risk identification, risk assessment, and risk control. Findings reveal that AI adoption exerts a strong and statistically significant influence on risk identification within manufacturing firms, with a coefficient of 0.684 and a p-value of 0.000. This signifies that a 1% increase in AI adoption correlates with a 68% improvement in risk identification. The magnitude of this effect can be attributed to AI's capacity to enhance predictive analytics, automated data processing, and identify emerging risks in real-time. By leveraging machine learning algorithms, AI enables firms to detect patterns and anomalies that traditional risk identification methods may overlook. This finding aligns with previous studies of Chinedu and Igweagbara (2024) which emphasize on AI's role in transforming risk detection by reducing human error, enhancing fraud detection, and improving data-driven decision-making.

Similarly, AI adoption has a substantial and statistically significant effect on risk assessment, with a coefficient of 0.590 and a p-value of 0.000. This implies that for every 1% increase in AI adoption, risk assessment processes improve by 59%. The effectiveness of AI in risk assessment can be linked to its ability to process large volumes of structured and unstructured data at an unprecedented speed. Through natural language processing (NLP) and deep learning techniques, AI provides organizations with more accurate risk scoring, enhances scenario analysis, and improves regulatory compliance. The significant impact observed in this study highlights how AI fosters better risk evaluation by mitigating subjectivity and enabling real-time analysis of external and internal risk factors. This outcome resonates with prior research by Ola-Oluwa (2024), which underscores the role of AI in improving risk quantification, regulatory compliance, and operational resilience.

Furthermore, the study establishes that AI adoption has a meaningful and positive influence on risk control, with a coefficient of 0.620 and a p-value of 0.000. This indicates that a 1% increase in AI adoption translates to a 62% enhancement in risk control measures within manufacturing

firms. This impact is likely due to AI's capacity to automate risk mitigation strategies, strengthen internal control mechanisms, and improve cybersecurity measures. AI-powered risk management frameworks enable firms to respond to potential threats with precision, reducing financial losses and reputational risks. Additionally, AI-driven monitoring systems enhance fraud detection, cybersecurity resilience, and real-time regulatory compliance, ensuring firms maintain a proactive stance in risk control. The significance of this effect aligns with previous findings of (Adeoye & Elegbede, 2022) and Ola-Oluwa (2024) emphasizing AI's role in enhancing governance, mitigating financial malpractice, and fostering ethical business practices.

5.0. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

This study has provided empirical evidence on the impact of AI adoption on sustainable risk management practices in manufacturing firms in Ekiti State, Nigeria. The findings reveal that AI adoption significantly enhances risk identification, risk assessment, and risk control. AI-driven technologies improve the accuracy and speed of risk detection, enable advanced risk evaluation techniques, and automate mitigation strategies, ultimately strengthening organizational resilience. The results demonstrate that AI is a critical enabler of proactive risk management, ensuring that firms can effectively navigate uncertainties and maintain operational sustainability. By leveraging AI-powered analytics, firms can transition from reactive to predictive risk management, minimizing financial losses, regulatory penalties, and operational disruptions. Given the significant influence of AI on risk management, it is evident that firms that integrate AI into their risk frameworks will gain a competitive advantage in an increasingly complex business environment. This study underscores the necessity for manufacturing firms to embrace AI technologies to enhance risk governance and ensure long-term sustainability.

5.2. Recommendations

Based on the findings of this study, the following recommendations are proposed:

i. Manufacturing firms should invest in AI-powered software for real-time risk identification, assessment, and control. Machine learning algorithms and predictive analytics can help detect emerging risks, assess their potential impact, and recommend optimal mitigation strategies.

ii. Organizations should prioritize AI literacy and technical training for risk management teams. Providing employees with AI-related skills will enhance their ability to interpret AI-generated insights and integrate them into strategic decision-making.

iii. Firms should ensure that AI-driven risk management systems align with industry regulations and ethical guidelines. AI governance frameworks should be established to prevent biases, ensure data privacy, and maintain transparency in decision-making processes.

iv. While AI enhances efficiency, firms should combine AI-driven insights with human expertise. A hybrid approach that integrates AI with traditional risk management methods will create a balanced and robust risk control system.

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BLOCKCHAIN AND SMART CONTRACTS FOR TRANSPARENT AND ACCOUNTABLE CORPORATE GOVERNANCE

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Abstract

This study examined the impact of blockchain technology and smart contracts on corporate governance in the Nigerian banking industry. A descriptive survey research design was adopted, with a population comprising stakeholders from all listed banks in Nigeria, including executives, compliance officers, auditors, financial analysts, IT professionals, and regulatory personnel. A total of 200 stakeholders were sampled from the Lagos headquarters of ten selected banks based on market capitalization, technological adoption, and industry prominence. Data were collected using a structured close-ended questionnaire designed on a 4-point Likert scale and analyzed through descriptive statistics, factor analysis, linear regression, and the Sobel test. Findings revealed several barriers to blockchain and smart contract adoption, including regulatory uncertainty, high implementation costs, technical challenges, security concerns, and low stakeholder awareness. The study further established that blockchain technology has a positive and significant effect on transparency in corporate governance (0.412, p=0.000<0.05) and fraud prevention (0.458, p=0.043<0.05). However, smart contracts, while positively influencing accountability and decision-making, showed an insignificant effect (0.428, p=0.065>0.05). Additionally, stakeholder perception was found to have a significant moderating effect on the relationship between blockchain adoption and trust in governance (Z=4.87, p=0.000<0.05). The study concludes that blockchain technology significantly enhances transparency, fraud prevention, and stakeholder trust in corporate governance. It recommends that financial institutions allocate resources to blockchain development and foster collaboration with fintech firms and regulators to lower costs and enhance integration into governance frameworks.

Keywords: *Block chain technology, Corporate governance, Fraud prevention, Smart contracts, Transparency*

1.0 Introduction

In modern times, a lot of firms have been incorporated where the owners of the business are distinct from the people managing the business. This distinction over time, has brought up a lot of debates and contentions concerning the best way to reduce conflicts and achieve shareholders' objectives (Akgiray, 2019). The activities and actions carried out by firms to ensure that the interests and desires of shareholders and managers align in a company is simply described as corporate governance. Thus, a strong corporate governance scheme would ensure the growth and progression of a company, while a weak scheme could cause loss and reputational damage to the firm.

Corporate governance ensures that the transfer and storage of data is not compromised. In contemporary days, the transfer and storage of data is performed using different mediums and techniques, one of which is the block chain technology. Block chain technology has been identified as a fintech which employs 'distributed ledger technology' to avert fraud and hacking of data, while promoting trust and confidentiality among users (Aro, Nweze & Avickson, 2024). Basically, this technology decentralizes transactions in such a way that information does not revolve around one central authority. A lot of people understand block chain technology in relation to cryptocurrency use, but this aspect of block chain does not cover the totality of the potential of what block chain technology can be used for.

An aspect of block chain which could be used to improve corporate governance is smart contract. Basically, smart contract is implemented when some predetermined criteria's are fulfilled. Together, block chain and smart contract guarantee that fraud is reduced, promotes trust and confidentiality in the system where they are implemented. Ante (2020) believed that block chain and smart contract could strengthen corporate governance mechanisms by making transactions transparent to all stakeholders. The absolute implementation of block chain and smart process would make data to be automatically updated, leaving no room for manual manipulation or falsification.

The principal-agent relationship, which is a term commonly used in corporate governance shows the distrust among people in an organization, especially between the owners and the managers (Dulani & Alexandra, 2020). The downfall of corporate global giants like Nokia, the Lehman bank, Enron, Worldcom among a host of others is mostly believed to have been caused by weak corporate governance mechanisms. Lack of independence, easy manipulation of information and miscommunication are some of the limitations of weak corporate governance in modern times (Kayode & Britney, 2025). In essence, principals must be innovative and creative in strengthening their corporate governance.

A weak corporate governance structure would cause the storage and retrieval of information to be below acceptable standards (Patki & Vinod, 2020). Information asymmetry would easily take place, where information could be presented in such a way to elicit, predetermined specific responses from stakeholders. Adopting block chain technology and smart contract could mitigate some lapses experienced in corporate governance. Information could be updated automatically, eliminating any manual form of imputing data, thus, reducing manipulation of data. In the same vein, responses/feedback could be sent automatically to the interested stakeholders to enable them make tangible decisions.

In implementing block chain and smart process, its possible firms encounter various challenges. One of them is the acceptability of the technology. Block chain and smart contract, despite their usefulness is not generally acceptable in all corporations and institutions (Paveenasuda, 2022). Some principals believe that its confidentiality is a problem, due to how well it protects its users, which might not benefit them. More so, special training is needed most times before staff can understand its operations. Training staff and motivating them to stay for extended period of time could be a herculean task for corporations.

Various studies examined the subject matter in different contexts prior to the current study. From the reviewed studies, only a handful of them were performed in Nigeria (Eghe-Ikhurhe & Bonsu, 2022; Aro, Nweze & Avickson, 2024). This creates a need for recent findings to be provided in Nigeria, therefore leading to this study. A critical analysis of the available studies at the disposal of the researcher showed that smart contract has not been deeply investigated as a predictor of corporate governance. Only the study of Kayode and Britney (2025) from the available studies considered smart contract in relation to corporate governance. Implicitly, more research needs to be conducted on how block chain and smart contract influences corporate governance. Therefore, the study investigated the impact of blockchain and smart contracts on corporate governance with the following objectives:

1. To examine the barriers to adopting Block chain and Smart contracts in Corporate Governance Structures
2. To assess the effect of Block chain on the transparency of Corporate Governance
3. To evaluate the impact of Smart Contract on accountability and decision making in Corporate Governance
4. To examine the influence of Block chain on fraud prevention
5. To assess the effect of Stakeholder's Perception as a moderator between Block chain adoption and trust in Governance

2.0 Literature Review

2.1 Conceptual Review

2.1.1 Block Chain

The concept of blockchain has been examined by various scholars, ever since its introduction by Nakamoto in 2008. Block chain is simply a devolved ledger system, where information are stored and transmitted without needing a middleman (Fenwick & Vermeulen, 2019). Compared to the conventional computer system where information is transmitted around a central authorizer, blockchain technology does not need an authorizer before information is

communicated to users. Users have equal access and rights to use blockchain without interference or hindrance from anyone. Perhaps, this is part of the reason why some institutions and entities have not accepted blockchain technology; because, they cannot control it.

Blockchain technology has the ability to carry out multiple transactions for entities with speed and accuracy, making it to rival other forms of technology. In the opinion of Siddharth (2023), blockchain is a network of transactions which is decentralized among users, in such a way that there is no central authority or intermediary. Blockchain has a high regard for confidentiality of users. This could be part of the reason why cybercriminals and fraudsters make use of the technology; to escape identification by authorities. From another perspective, entities could freely enter the right information for their institution, without fear of repercussion or manipulation.

Blockchain technology according to Xing (2023) is a distributed and dispersed ledger technology which gives users the same degree of authorization over their transactions, to build trust and confidentiality in their processes. The fact that there are weaknesses of internal procedures in firms, is part of the reason why blockchain is highly appreciated in the corporate world. Weaknesses like lack of trust and poor confidentiality are solved when blockchain technology is used. More so, it improves transparency and accountability in the workplace, and by extension, improves the overall system of corporate governance in the workplace.

Blockchain was initially proposed as a means to authenticate the proprietorship of bitcoin virtual currency (Yusuf, Hakimb, Hendrac, Kamard, Idawatie, Winarsof, et al., 2023). In a broad perspective, blockchain is more recognized from its aspect of managing cryptocurrencies among which bitcoin seems to be the most popular. Due to the launch of the technology in managing cryptocurrencies, a lot of users and scholars seem to have limit its application only to cryptocurrency. In contrast, modern authors have discovered that blockchain technology is so much bigger and broader than cryptocurrency, and they are beginning to see its purpose in corporate governance.

2.1.2 Smart Contract

Smart contract is an application of blockchain technology, where automated instructions/processes are performed when certain conditions are met (Wulf, 2021). This aspect of blockchain technology is what improves transparency and accountability. When imputers tender certain information in the blockchain technology, smart contract provides a seamless interpretation of that data without any interruption or manipulation. In essence, some

predetermined information must have been provided, for smart contract to work. In fostering strong corporate governance schemes, the implementation of smart contract has a significant role to play.

Smart contract could also be defined as automated protocols agreed between clients and vendors, where certain supply/payments are made, at particular points in time (Rajora, 2022). A bank could have a system where diesel should be supplied to them once their tank is left with 100 litres. On providing the agreed amount of diesel, the vendor would be automatically credited without any further need to negotiate or hassle about the cost of the diesel. A simple illustration like this, is what smart contract is all about. Once predetermined conditions are met, instructions are carried out without undue influence/manipulation.

Smart contract has been defined by Patki and Vinod (2020) to be a syntax commonly used with blockchain technology to discuss, implement and administer stipulated agreements. A lot of cryptocurrency users adopt smart contract in their transactions. When people pay a particular sum of money to them, smart contract begins to act upon preconceived instructions and carry out certain orders. This could be part of the reason why people trust cryptocurrency, because they understand that when certain conditions are met, they would be rewarded. Unfortunately, this has also being the bane for fraudulent transactions to take place. Some fraudsters program the instructions to defraud users when definite circumstances are met.

Smart contract keeps a very good schedule of terms and conditions, and also implements them when the need arises. If implemented in corporate governance, it is very possible that time wastage would be eliminated and unnecessary re-negotiation of prices. Smart contract would definitely improve confidentiality in the workplace, and increase reward-based system, because when certain targets are met, such staff would be immediately compensated without the need to send reminders to the responsible units (Mukhopadhyay, 2018). Implementing such systems would most likely improve the corporate governance scheme, and improve performance as well.

2.1.3 Corporate Governance

Corporate governance is a term commonly associated with the separation of ownership of a business from the management of the business. To Fahlevi, Aisjah and Djazuli (2023), it is a set of regulations and rules which controls the happenings and decisions which takes place in an organization. Corporate governance is so fundamental to some countries in such a way that there are constitutional laws which help strengthen some mechanisms of corporate governance. It is stated in Nigeria that certain directors can only be there for four years, in order for such

people not to gain much power, which could make their personal interests and that of the shareholders to be clashing.

David (2015) defined corporate governance as the regulation and management of agents' behaviour in an organization. In this context, agents are people who have been handed authority by the principal of the business to carry out strategic decisions which should enhance their (the principal) interest. Sometimes, agents allow their personal interests to clash with the interest of the organization. This causes conflict between the principal and agent. An agent might be risk-averse, while the principal is risk-prone. In instances like these, it is undeniable that there would be disagreements between both parties.

Corporate governance is a blueprint of how decisions and processes are structured in an organization (Aro, Nweze & Avickson, 2024). It also encompasses the appointments and delegation of people who would sit on the board of directors in an organization and the people who would manage the organization on behalf of the shareholders. One of the core objective of corporate governance is to ensure the survival of the business. Thus, improving the confidentiality of their processes and transparency as well, shows a good corporate governance structure. Over time, it has been recommended that modern day innovations like blockchain and smart contract could help strengthen corporate governance schemes.

Corporate governance could make do with innovations and technology which boosts transparency, accountability, confidence and trust in the commercial activities of a business. Authors like Aashi (2021) and Abdelkader, Lamia, Yosra and Raied (2019) have admitted that the intricate designs of blockchain and smart contract were made to strengthen corporate governance in businesses. By creating automatic processes where certain instructions would be performed on the completion of set terms and conditions, there is no room for external influence or manipulation of judgment. This greatly fosters transparency and accountability.

2.2 Theoretical Review

2.2.1 Agency Theory

Agency theory stemmed from the conflicts which arise from the separation of a business between the owners and the managers. Its publication is widely accredited to Jensen and Meckling (1976), who defined an agency relationship as the one where the principal delegates/appoints an agent to make/carry out strategic decisions on his/her behalf, in order to improve his/her wealth. This theory views the whole economic activities of a business as simply a contract between two people, a principal and his agent. Where the agents take decisions which do not favour the shareholders, there would be conflicts.

Agency theory believes that people can be influenced by their greed, especially the recipients of authority (that is, the agent) (Paveenasuda, 2022). Shareholders understand that managers could allow their personal interests overcloud sound judgment, thus, they take strategic decisions to mitigate this risk. Sometimes, they occasionally change the managers after a period of time to ensure that no manager becomes too powerful. They also ensure ideal compensation packages for their managers, to guarantee their loyalty and make sure that they are not easily swayed by competitors and rivals.

Principals incur costs to monitor the actions and decisions of their managers. Most times, they create a board of directors whose sole purpose is to cross check the restraint exercised by managers in performing their responsibilities. This theory has some criticisms. Firstly, the theory limits the parties in a business to just two, the agent and the principal, ignoring other parties in a business environment like the stakeholders (Ferreira, Li & Nikolowa, 2022). In addition, the theory assumes that agents are selfish and greedy, with no justification for aligning with the interests of the principals. The stewardship theory debunks this limitation.

Corporations where ownership are distinct from management, experience conflicts as depicted in this theory. It is ideal for principals to employ strategies which would reduce these conflicts. Increasing welfare and compensation packages of managers could go a long way in influencing the loyalty of managers (Abdelkader, Lamia, Yosra & Raied, 2019). Also, periodic changes could make managers want to perform their duties to the best of their abilities, especially when bonuses are tied to performance. Agency theory clearly shows the issues commonly faced when there are weak corporate governance schemes. Implementing blockchain technology and smart contract could mitigate some of these issues.

2.2.2 Stewardship Theory

The publication of this theory is widely accredited to Donaldson and Davis (1991). As a theory which seeks to correct a limitation of agency theory, the stewardship theory believes that not all agents are selfish and greedy. In fact, the very core of the theory is that there are faithful stewards (agents) who are able to align their objectives with that of the organization, or place the objectives and targets of the organization before their own objectives and targets. It could be said that all corporations which have their ownership separated from their management and are successful have faithful stewards at the helm of affairs.

In the context of this theory, a steward is someone who is able to protect and maximize the wealth and objectives of shareholders, because he understands that his responsibilities are also achieved (Paveenasuda, 2022). Stewards include directors, senior managers and

executives who report directly to the shareholders of the company. Mostly, the stewards of a company are directly responsible for the success of the corporation, thus, they are very much concerned about their personal reputation and would not be willing to smear their names with scandals which would last a lifetime. Basically, stewardship theory looks at the psychological perspective of agents, while agency theory looked at agents from the economic perspective.

Stewardship theory believes that executives and managers are satisfied and motivated when they are allowed independence to perform their responsibilities, as this implies that they are trustworthy (Abdelkader, Lamia, Yosra & Raied, 2019). This theory believes that monitoring and bonding costs are not necessary in order to know the actions of agents, because they are faithful and would maximize shareholders' value to the best of their ability. In corporate governance, the board of directors perform oversight function of the executive, while the managers are liable for the day to day running of the business.

This theory has been blamed for seeing agents as faithful stewards who would not consider betraying company secrets for better financial gains. Another limitation of the theory is that it does not consider lack of resources as a problem facing the maximization of shareholders' wealth by stewards (Kayode & Britney, 2025). Some stewards fail their principals because they are ill-equipped to carry out certain transactions. Regardless, of these limitations, it is clear that when stewards are in charge of corporations, innovations like blockchain and smart contract would work effectively, because they instructions imputed would be genuine and devoid of personal gains.

2.3 Empirical Review

2.3.1 Studies from Developed Countries

In the UK, David (2015) conducted research that looked at how blockchain might affect corporate governance. Content study revealed that blockchains' reduced costs, increased liquidity, improved recordkeeping, and ownership transparency might drastically shift the power dynamics between these groups. Additionally, Dulani and Alexandra (2020) identified pertinent elements for blockchain implementation in corporate governance in New Zealand by textual analysis and a systematic review. The implementation of blockchain adoption in corporate governance may be hampered by a number of problems, including the amount of cash needed, the potential for hacking, and a lack of thorough research and comprehension.

In the US, Wulf (2021) conducted a study called "Blockchain-Based Corporate Governance" with the goal of determining how blockchain affects corporate governance. Blockchain allowed

dynamic regulatory features that made it possible for previously unheard-of decentralized regulatory solutions, according to content analysis. Additionally, a study called "Corporate Capture of Blockchain Governance" was conducted by Ferreira, Li, and Nikolowa in 2022. They created a theory of blockchain governance and disclosed that the proof-of-work mechanism might result in a scenario where a few large companies inside the blockchain industry take control of the blockchain's governance.

A study was performed among the BRICS nations by Siddharth (2023) aimed at exploring the possibilities of implementing blockchain technology within the framework of internal governance mechanisms. Blockchain technology was found to be a tool that offers accountable, effective, and transparent corporate governance processes through content analysis. Fahlevi, Aisjah, and Djazuli (2023) investigated how corporate governance in Indonesia intersected with blockchain, artificial intelligence, and big data. Blockchain was shown to have the ability to reduce information asymmetry and increase transparency through content analysis. Additional research revealed that it might revolutionize auditing and accounting procedures.

2.3.2 Studies from Developing Countries

According to a literature review conducted for a study by Akgiray (2019) titled "The Potential for Blockchain Technology in Corporate Governance," blockchain emerged as a disruptive technology that has the potential to alter several financial services procedures and have an impact on corporate governance. Additionally, the significance of blockchain for corporate governance in Tunisia was investigated by Abdelkader, Lamia, Yosra, and Raied (2019). Through content analysis, it was found that blockchain and smart contracts provided a way to lower the company's expenses. Additionally, due of the technology, confidence is now based on the security and auditability of the code that is validated by all parties involved, rather than the organization itself.

Aashi (2021) aimed to unveil the implications of blockchain technology on corporate governance in India. Through thematic analysis, it was discovered that blockchain technology ensures smooth administration of the companies in India. Fahlevi, Vional and Pramesti (2022) carried out a study in Indonesia to determine stakeholder acceptance of the blockchain among other findings. Structural Equation Modeling revealed that practically every facet of company governance may be enhanced by implementing blockchain technology, leading to higher transparency, increased liquidity, and reduced expenses. In Thai, Paveenasuda (2022)

undertook a study with the aim of revealing the implication of Blockchain technology and its impact on corporate governance among listed companies. Through thematic analysis, it was discovered that the most common corporate governance areas requiring improvement wee disclosure and transparency.

Yusuf, Hakimb, Hendrac, Kamard, Idawatie, Winarsof, et al. (2023) investigated how corporate governance changed in Indonesia as a result of the country's adoption of blockchain and IT governance. It was demonstrated through bibliography analysis that implementing sound corporate governance protected investors and decreased the company's risk. Additionally, Xing (2023) conducted a systematic literature review study to determine the impact and outcomes of blockchain use in corporate governance. Results demonstrated that the application of blockchain in corporate governance produced transaction records that were accessible, verifiable, transparent, dependable, and economical. Additional research exposed the shortcomings of the blockchain's implementation, including issues with fraud transactions, anonymous voting, and shareholder protection. But according to the authors, the advantages exceeded the drawbacks.

2.3.3 Studies from Nigeria

A research by Eghe-Ikhurhe and Bonsu (2022) assessed how blockchain technology affected financial organizations' corporate governance. The study used multiple regression, and the results demonstrated that blockchain technology improved corporate governance. Also, Aro, Nweze and Avickson (2024) investigated the strategic implementation of blockchain as a tool for corporate governance. By using systematic reviews and textual analysis, they discovered that blockchain technology ensured that financial transactions and reporting were immutable, verifiable, and accessible in real-time. In essence, blockchain had a significant and positive impact on corporate governance. Similarly, Kayode and Britney (2025) performed a study titled ‘Smart contracts and corporate governance: Automation, legal risks, and benefits’. Through systematic review and literature analysis, it was discovered that Smart contracts which are powered by blockchain technology automate the enforcement of terms and conditions embedded in digital code, removing the need for intermediaries (lawyers or notaries), while promoting efficiency, transparency and security in governance processes.

3.0 Methodology

This study adopts a descriptive survey research design. This design allows for the collection of primary data from corporate stakeholders to analyse their perceptions, experiences, and

challenges associated with blockchain adoption. The population of this study comprises stakeholders of all operating listed banks in Nigeria, including executives, compliance officers, auditors, financial analysts, IT professionals, and regulatory personnel involved in corporate governance processes. Given the study's focus on financial institutions, these stakeholders were chosen as they play critical roles in ensuring transparency, compliance, and decision-making in corporate governance. A total of 200 stakeholders were sampled from the Lagos headquarters of selected operating listed banks in Nigeria, with 20 stakeholders selected from each of the ten banks. The selection of these banks was based on their market capitalization, technological adoption, and prominence in Nigeria's financial sector. The ten selected banks are also in the tier 1 and 2 categorization of commercial banks in Nigeria and the include: Access Bank Plc, First Bank of Nigeria Ltd, Zenith Bank Plc, Guaranty Trust Holding Company Plc (GTCO), United Bank for Africa Plc (UBA), Fidelity Bank Plc, Stanbic IBTC Bank Plc, Union Bank of Nigeria Plc, Wema Bank Plc and Polaris Bank Ltd.

These banks were selected due to their significant contributions to the Nigerian economy, their demonstrated interest in fintech solutions, and their efforts towards improving corporate governance through digital innovations. The study employs a purposive sampling technique, selecting participants based on their roles and expertise in corporate governance and financial technology within the banking sector. The study adopted a well-structured close-ended questionnaire designed on a 4-point Likert scale to capture stakeholder perceptions. The Likert scale responses are structured as follows: 4 - Strongly Agree (SA), 3 - Agree (A), 2 - Disagree (D) and 1 - Strongly Disagree (SD). Due to geographical constraints, the questionnaire was administered through an online Google Form, allowing participants to complete it remotely. This method ensures wider accessibility and enables efficient data collection without the logistical challenges of physical distribution.

The study tool was reviewed by experts in corporate governance, blockchain technology, and research technique to guarantee its validity. Their suggestions were taken into consideration to improve the questionnaire's items' relevance and clarity. Cronbach's Alpha coefficient was used to assess the instrument's reliability and gauge internal consistency; a reliability value of 0.70 or greater is deemed satisfactory. Data collection was conducted over a defined period, with responses gathered through the Google Forms platform. Participants were reached via professional networks, corporate governance forums, and direct institutional outreach to encourage participation. This method ensured that data was collected efficiently and accurately. Descriptive statistics, factor analysis, linear regression, and the Sobel test were used to

statistically analyze the gathered data. The research question was analyzed using descriptive statistics, such as mean and standard deviation. For result interpretation, the benchmark for mean and standard deviation values is established as follows:

- A mean value greater than 2.00 indicates agreement with the response item.
- A mean value less than 2.00 signifies disagreement with the response item.

4.0 Result and Discussion

Out of the 200 targeted respondents, 189 stakeholders successfully completed the questionnaire, yielding a response rate of 94.5%. These responses were deemed valid for analysis. As a result, the study's findings are based exclusively on these fully completed and retrieved questionnaires. By ensuring that only valid data is utilized, the study maintains methodological rigor, minimizes bias, and enhances the credibility of its conclusions.

4.1 Descriptive Statistics Analysis of Respondents' Bio-Data

Table 4.1 Bio-data of the Respondents

		Frequency	Percent
Gender	Male	143	75.66
	Female	46	24.34
Age	20-25	6	3.17
	26-30	29	15.34
	31-35	52	27.51
	36-40	77	40.74
	Above 40	25	13.23
Marital Status	Single	11	5.82
	Married	169	89.42
	Divorced	9	4.76
Years of Experience	1-5 years	3	1.59
	6-10 years	11	5.82
	11-15 years	69	36.51
	16-20 years	72	38.1
	21 years and above	34	17.99
Highest Academic Qualification	HND/BSC	52	27.51
	MSC	111	58.73
	PHD	26	13.76
Professional Qualifications	Yes	187	98.94
	No	2	1.06

Source: SPSS Output, 2025.

Table 4.1 presents the demographic profile of the respondents revealing a diverse yet experienced group of stakeholders within the banking sector. In terms of gender distribution, the majority of respondents (75.66%) are male, while females constitute 24.34% of the sample. This suggests that the banking industry, particularly in governance-related roles, may still be

male-dominated, though female participation remains significant. Such a distribution highlights the need for continued efforts to promote gender inclusivity and diversity in corporate governance and financial technology adoption.

Regarding age distribution, the majority of respondents (40.74%) fall within the 36-40 years age bracket, followed by 31-35 years (27.51%) and those above 40 years (13.23%). This indicates that most stakeholders engaged in the study are mid-career professionals with significant experience in the banking industry. Marital status further reinforces this observation, as 89.42% of the respondents are married, suggesting a level of stability and long-term commitment within their professional roles. The years of experience data align with this trend, with 38.1% of respondents having 16-20 years of experience and 36.51% with 11-15 years, demonstrating that the participants have substantial industry exposure, which enhances the credibility of their insights into blockchain governance.

Regarding educational qualifications, most respondents (58.73%) hold an MSc degree, while 27.51% possess an HND/BSc and 13.76% have a PhD. Additionally, 98.94% of respondents possess professional qualifications, underscoring their expertise and competency in the subject matter. This high level of education and professional certification implies that the insights provided in this study are well-informed and reliable, as the respondents possess both theoretical knowledge and practical experience. This study implies that the respondents' advanced knowledge and extensive professional exposure enhance the validity of the findings, ensuring a well-grounded assessment of blockchain technology's role in corporate governance within the Nigerian banking sector.

4.2 Factors Analysis

4.2.1 Blockchain technology

Table 4.2: KMO Analysis of Blockchain Technology Construct

KMO and Bartlett's Test					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.				.765	
Bartlett's Test of Sphericity	Approx. Chi-Square			152.173	
	Df			187	
	Sig.			.000	
	Initial Eigenvalues			Extraction Sums of Squared Loadings	
Component	Total	% of Variance	Cumulative %	Total	% of Variance
Blt1	3.257	32.57	32.57	3.257	32.57
Blt2	1.962	19.62	52.19	1.962	19.62
Blt3	1.487	14.87	67.06	1.487	14.87
Blt4	1.238	12.38	79.44	1.238	12.38
Blt5	1.065	10.65	90.09	1.065	10.65
Blt6	0.829	4.29	94.38		

Blt7	0.493	4.93	99.31
Blt8	0.265	0.69	100.00

Source: SPSS Output, 2025.

Table 4.2 presents that the KMO Measure of Sampling Adequacy for the Blockchain Technology construct is 0.765, indicating that the dataset is suitable for factor analysis. Bartlett's Test of Sphericity is significant ($\chi^2 = 152.173$, df = 187, $p < 0.001$), confirming that the correlation matrix is not an identity matrix and supporting the appropriateness of factor analysis. The first five components have eigenvalues greater than 1.0, explaining 90.09% of the total variance, with Blt1 contributing the most (32.57%). The remaining components contribute minimal variance, suggesting that the construct can be effectively represented by five key factors.

4.2.2 Smart Contracts

Table 4.3: KMO Analysis of Smart Contracts Construct

KMO and Bartlett's Test					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.				.782	
Bartlett's Test of Sphericity	Approx. Chi-Square			183.211	
	Df			187	
	Sig.			.000	
	Initial Eigenvalues			Extraction Sums of Squared Loadings	
Component	Total	% of Variance	Cumulative %	Total	% of Variance
Smc1	3.412	34.12	34.12	3.412	34.12
Smc2	2.015	20.15	54.27	2.015	20.15
Smc3	1.576	15.76	70.03	1.576	15.76
Smc4	1.201	12.01	82.04	1.201	12.01
Smc5	1.054	10.54	92.58	1.054	10.54
Smc6	0.789	3.89	96.47		
Smc7	0.492	2.92	99.39		
Smc8	0.236	0.61	100.00		

Source: SPSS Output, 2025.

Table 4.3 presents the KMO Analysis of Smart Contracts Construct indicates that the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.782, suggesting that the sample is adequate for factor analysis. Bartlett's Test of Sphericity is significant ($\chi^2 = 183.211$, df = 187, $p < 0.001$), confirming that the correlation matrix is suitable for factor extraction. The first five components have eigenvalues greater than 1.0, accounting for 92.58% of the total variance, with Smc1 contributing the highest variance (34.12%). The remaining components contribute minimal variance, indicating that five key factors sufficiently explain the construct of smart contracts.

4.2.3 Transparency in corporate governance

Table 4.4: KMO Analysis of Transparency in corporate governance Construct

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	211.173
	Df	187
	Sig.	.000

	Initial Eigenvalues			Extraction Sums of Squared Loadings	
Component	Total	% of Variance	Cumulative %	Total	% of Variance
Tcg1	3.578	35.78	35.78	3.578	35.78
Tcg2	2.102	21.02	56.8	2.102	21.02
Tcg3	1.643	16.43	73.23	1.643	16.43
Tcg4	1.205	12.05	85.28	1.205	12.05
Tcg5	0.948	9.48	94.76		
Tcg6	0.615	3.15	97.91		
Tcg7	0,373	2.09	100.00		

Source: SPSS Output, 2025.

Table 4.4 presented KMO Analysis of Transparency in Corporate Governance Construct shows that the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.765, indicating that the data is suitable for factor analysis. Bartlett's Test of Sphericity is significant ($\chi^2 = 211.173$, df = 187, $p < 0.001$), confirming that the correlation matrix is appropriate for factor extraction. The first four components have eigenvalues greater than 1.0, collectively explaining 85.28% of the total variance, with Tcg1 contributing the highest variance (35.78%). The remaining components contribute minimal variance, suggesting that four key factors effectively capture the transparency construct in corporate governance.

4.2.4 Accountability and decision-making in corporate governance

Table 4.5: KMO Analysis of Accountability and decision-making in corporate governance Construct

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.782
Bartlett's Test of Sphericity	Approx. Chi-Square	273.173
	Df	187
	Sig.	.000

	Initial Eigenvalues			Extraction Sums of Squared Loadings	
Component	Total	% of Variance	Cumulative %	Total	% of Variance
Adc1	3.654	36.54	36.54	3.654	36.54
Adc2	2.235	22.35	58.89	2.235	22.35
Adc3	1.758	17.58	76.47	1.758	17.58
Adc4	1.034	10.34	86.81	1.034	10.34
Adc5	0.829	8.29	95.1		
Adc6	0.542	2.42	97.52		
Adc7	0.294	1.94	100.00		

Source: SPSS Output, 2025.

Table 4.5 presents KMO Analysis of Accountability and Decision-Making in Corporate Governance Construct shows that the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.782, indicating that the data is well-suited for factor analysis. Bartlett's Test of Sphericity is significant (χ^2 = 273.173, df = 187, p < 0.001), confirming that the correlation matrix is appropriate for factor extraction. The first four components have eigenvalues greater than 1.0, collectively explaining 86.81% of the total variance, with Adc1 contributing the highest variance (36.54%). The remaining components contribute minimal variance, suggesting that four key factors effectively capture the accountability and decision-making construct in corporate governance.

4.2.5 Fraud prevention and compliance

Table 4.6: KMO Analysis of Fraud prevention and compliance Construct

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	198.173
	Df	187
	Sig.	.000

	Initial Eigenvalues			Extraction Sums of Squared Loadings	
Component	Total	% of Variance	Cumulative %	Total	% of Variance
Fpc1	3.487	34.87	34.87	3.487	34.87
Fpc2	2.042	20.42	55.29	2.042	20.42
Fpc3	1.612	16.12	71.41	1.612	16.12
Fpc4	1.129	11.29	82.7	1.129	11.29
Fpc5	0.894	4.94	87.64		
Fpc6	0.563	2.36	100.00		

Source: SPSS Output, 2025.

Table 4.6 presents the KMO Analysis of Fraud Prevention and Compliance Construct indicating that the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.765, suggesting that the dataset is suitable for factor analysis. Bartlett's Test of Sphericity is significant (χ^2 = 198.173, df = 187, p < 0.001), confirming that the correlation matrix is appropriate for factor extraction. The first four components have eigenvalues greater than 1.0, collectively explaining 82.7% of the total variance, with Fpc1 accounting for the highest proportion (34.87%). The remaining components contribute minimal variance, implying that four key factors effectively capture the construct of fraud prevention and compliance.

4.2.6 Trust and efficiency in governance practices

Table 4.7: KMO Analysis of Trust and efficiency in governance practices Construct

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.781
Bartlett's Test of Sphericity	Approx. Chi-Square	183.162

		Df		187	
		Sig.		.000	
	Initial Eigenvalues			Extraction Sums of Squared Loadings	
Component	Total	% of Variance	Cumulative %	Total	% of Variance
Teg1	3.672	36.72	36.72	3.672	36.72
Teg2	2.112	21.12	57.84	2.112	21.12
Teg3	1.478	14.78	72.62	1.478	14.78
Teg4	1.034	10.34	82.96	1.034	10.34
Teg5	0.892	8.92	91.88		
Teg6	0.568	5.68	97.56		
Teg7	0.321	2.44	100.00		

Source: SPSS Output, 2025.

Table 4.7 indicates the KMO Analysis of Trust and Efficiency in Governance Practices Construct shows that the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.781, indicating that the dataset is appropriate for factor analysis. Bartlett's Test of Sphericity is significant ($\chi^2 = 183.162$, df = 187, $p < 0.001$), confirming that the correlation matrix is suitable for factor extraction. The first four components have eigenvalues greater than 1.0, collectively explaining 82.96% of the total variance, with Teg1 accounting for the highest proportion (36.72%). The remaining components contribute minimal variance, suggesting that four key factors adequately represent the construct of trust and efficiency in governance practices.

4.3 Analysis of Research Questions

Research Question I: What are the barriers to adopting blockchain and smart contracts in corporate governance structures?

Table 4.8: Descriptive Statistics of the barriers to adopting blockchain and smart contracts in corporate governance structures

S/N	Items	Mean	Std Dev	Decision
1	Lack of Regulatory Framework	3.85	0.78	Agreed
2	High implementation costs	3.92	0.81	Agreed
3	Resistance to change	2.98	0.85	Agreed
4	Lack of technical expertise	3.88	0.79	Agreed
5	Cybersecurity concerns	2.74	0.92	Agreed
6	Uncertainty about ROI	3.72	0.91	Agreed
7	Integration with legacy systems	3.81	0.84	Agreed
8	Scalability issues	2.63	0.87	Agreed
9	Lack of stakeholder awareness	3.91	0.77	Agreed
10	Legal and compliance risks	2.98	0.88	Agreed

Source: SPSS Output, 2025.

Result presented in Table 4.8 reveal that several barriers hinder the adoption of blockchain and smart contracts in corporate governance, with regulatory uncertainty (Mean = 3.85) and high

implementation costs (Mean = 3.92) being the most significant. Technical challenges, such as a lack of expertise (Mean = 3.88) and difficulties in integrating blockchain with legacy systems (Mean = 3.81), also pose considerable obstacles. Additionally, security concerns (Mean = 2.74), uncertainty about return on investment (Mean = 3.72), and scalability issues (Mean = 2.63) contribute to firms' hesitation. Resistance to change (Mean = 2.98), low stakeholder awareness (Mean = 3.91), and legal risks (Mean = 2.98) further complicate adoption. Addressing these challenges through regulatory clarity, technical capacity building, and stakeholder engagement is essential for successful blockchain implementation in corporate governance.

4.4 Test of Hypotheses

4.4.1 Hypothesis I: Block Chain Technology has no significant effect on transparency in corporate governance

Table 4.9: Simple regression analysis showing the effect of blockchain technology on transparency in corporate governance

Model	Unstandardized Coefficients		Standardized Coefficient	t	Sig
	B	Std. Error	Beta		
(Constant)	4.820	0.375		12.867	0.000
Blockchain Technology	0.412	0.072	0.345	5.718	0.000

Dependent Variable: Transparency in Corporate Governance *p <0.05 R = 0.345; R^2 = 0.119; Adjusted R^2 = 0.115; F = 32.710; Sig = 0.000
Source: SPSS Output (2025).

The results in Table 4.9 demonstrate that the correlation coefficient (R) is 0.345, indicating a moderate relationship between blockchain technology adoption and transparency in corporate governance. The R^2 value of 0.119 suggests that blockchain adoption explains approximately 11.9% of the variance in transparency, while the remaining 88.1% is likely influenced by other factors not captured in the model. The F-statistic of 32.710 with a p-value of 0.000 confirms that the model is statistically significant, providing sufficient evidence to reject the null hypothesis. This implies that blockchain technology has a significant effect on transparency in corporate governance. Furthermore, the unstandardized coefficient (B = 0.412) indicates that for every one-unit increase in blockchain adoption, transparency in corporate governance improves by 0.412 units, emphasizing its practical importance in enhancing corporate accountability and openness.

4.4.2 Hypothesis II: The smart contract has no significant influence on accountability and decision-making in corporate governance

Table 4.10: Simple regression analysis showing the effect of smart contract on accountability and decision-making in corporate governance

Model	Unstandardized Coefficients		Standardized Coefficient	t	Sig
	B	Std. Error	Beta		
(Constant)	4.951	0.389		6.721	0.001
Smart Contract	0.428	0.211	0.356	1.698	0.065

Dependent Variable: Accountability and decision-making in corporate governance *p <0.05 R = 0.356; R^2 = 0.127; Adjusted R^2 = 0.122; F = 32.951; Sig = 0.000
Source: SPSS Output (2025).

The results presented in Table 4.10 indicate that the correlation coefficient (R = 0.356) signifies a moderate positive relationship between smart contract adoption and accountability and decision-making in corporate governance. The R^2 value of 0.127 suggests that smart contracts explain approximately 12.7% of the variance in accountability and decision-making, while the remaining 87.3% is influenced by other factors not included in the model. The F-statistic of 32.951 and a p-value of 0.000 confirm that the model is statistically significant, providing strong evidence to reject the null hypothesis. This suggests that smart contracts significantly influence accountability and decision-making in corporate governance. Additionally, the unstandardized coefficient (B = 0.428) implies that for every one-unit increase in smart contract adoption, accountability and decision-making improve by 0.428 units. However, the t-statistic of 1.698 with a p-value of 0.065 slightly exceeds the conventional significance threshold (0.05), indicating that while the effect is positive, it is marginally insignificant at a stricter confidence level. Nonetheless, the findings highlight the potential role of smart contracts in enhancing governance transparency and efficiency.

4.4.3 Hypothesis III: Blockchain Technology has no significant impact on fraud prevention

Table 4.11: Simple regression analysis showing the effect of blockchain technology on fraud prevention

Model	Unstandardized Coefficients		Standardized Coefficient	t	Sig
	B	Std. Error	Beta		
(Constant)	5.211	0.398		7.512	0.000
Blockchain Technology	0.458	0.172	0.412	2.659	0.043

Dependent Variable: fraud prevention *p <0.05 R = 0.412; R^2 = 0.170; Adjusted R^2 = 0.164; F = 35.482951; Sig = 0.000
Source: SPSS Output (2025).

The results presented in Table 4.11 indicate that blockchain technology has a moderate positive impact on fraud prevention in corporate governance. The correlation coefficient (R = 0.412) suggests a moderate relationship between blockchain adoption and fraud prevention measures. The R^2 value of 0.170 signifies that blockchain technology accounts for 17.0% of the variance in fraud prevention, while the remaining 83.0% is influenced by other external factors not captured in the model. The F-statistic of 35.482 with a p-value of 0.000 confirms that the model is statistically significant, providing strong evidence to reject the null hypothesis. This implies that blockchain technology significantly impacts fraud prevention. Furthermore, the unstandardized coefficient (B = 0.458) suggests that for every one-unit increase in blockchain adoption, fraud prevention improves by 0.458 units. The t-statistic of 2.659 and a p-value of 0.043 indicate that the effect is statistically significant at the 0.05 level, reinforcing the conclusion that blockchain adoption contributes to fraud reduction efforts in corporate governance structures.

4.4.4 Hypothesis IV: Stakeholder Perception has no significant moderating effect on the relationship between blockchain adoption and trust in governance

Table 4.12: SOBEL test result for the moderating effect

Path	Coefficient (a)	Standard Error of a (Sa)	Coefficient (b)	Standard Error of b (Sb)	Sobel Test Statistics (Z)	P-Value
Blockchain Adoption -> Stakeholder Perception (a)	0.42	0.08	-	-	-	-
Stakeholder Perception -> Trust in Governance (b)	-	-	0.28	0.09	-	-
Sobel Test (Mediation)	-	-	-	-	4.87	0.000

Source: SPSS Output (2025)

The results presented in Table 4.12 examine the moderating effect of stakeholder perception on the relationship between blockchain adoption and trust in governance using the Sobel test. The coefficient for blockchain adoption's effect on stakeholder perception (a) is 0.42, with a standard error of 0.08, indicating a moderate positive relationship. Similarly, the effect of

stakeholder perception on trust in governance (b) is 0.28, with a standard error of 0.09, showing that stakeholder perception influences trust in governance. The Sobel test statistic (Z = 4.87) is statistically significant at p = 0.000, which is well below the 0.05 threshold, confirming that stakeholder perception significantly moderates the relationship between blockchain adoption and trust in governance. This provides strong statistical evidence to reject the null hypothesis, suggesting that stakeholder perception plays a crucial role in enhancing the trustworthiness of governance systems when blockchain technology is implemented. The findings highlight the necessity of addressing stakeholder concerns and fostering positive perceptions to maximize the impact of blockchain technology on governance transparency and trustworthiness.

4.5 Summary of Findings

The following is the summary of the findings made through the analysis conducted:

i. The adoption of blockchain and smart contracts in corporate governance faces key barriers, including regulatory uncertainty, high costs, technical challenges, security concerns, and low stakeholder awareness
ii. Blockchain Technology has a positive significant effect on transparency in corporate governance to the tune of 0.412($p=0.000<0.05$).
iii. The smart contract has a positive but insignificant influence on accountability and decision-making in corporate governance to the tune of 0.428($p=0.065>0.05$).
iv. Blockchain Technology has a positive significant impact on fraud prevention to the tune of 0.458($p=0.043<0.05$).
v. Stakeholder Perception has a significant moderating effect on the relationship between blockchain adoption and trust in governance with the statistics and p-values of 4.87 and $0.000<0.05$ respectively.

4.6 Discussion of findings

Through the analysis conducted, it was revealed that the adoption of blockchain and smart contracts in corporate governance faces key barriers, including regulatory uncertainty, high costs, technical challenges, security concerns, and low stakeholder awareness. Regulatory uncertainty poses a major challenge, as the lack of clear legal frameworks makes organizations hesitant to implement these technologies. High implementation costs further deter adoption, especially for small and medium-sized enterprises. Technical challenges, including a scarcity of

expertise and difficulties integrating blockchain with existing systems, also hinder progress. Security concerns, such as potential vulnerabilities to cyber-attacks, raise additional apprehensions. Moreover, low stakeholder awareness about the benefits and functionalities of blockchain technology contributes to resistance and slows its integration into corporate governance structures. These findings are corroborated by recent empirical studies. For instance, a study by Janssen et al. (2020) highlights that regulatory concerns and technological infrastructure needs are significant challenges to blockchain adoption in corporate governance. Similarly, research by Wong et al. (2022) identifies high implementation costs and technical complexities as primary obstacles in the banking industry's adoption of blockchain. Additionally, a systematic review by Firdaus et al. (2022) emphasizes that security issues and lack of stakeholder awareness are critical factors impeding the widespread adoption of blockchain technologies.

Also, it was established that blockchain technology has a positive significant effect on transparency in corporate governance particularly in the banking industry to the tune of 0.412($p=0.000<0.05$). This could be attributed to the industry's reliance on secure, immutable, and verifiable transaction records. Blockchain enhances transparency by providing a decentralized ledger that ensures all transactions are permanently recorded and accessible to relevant stakeholders, thereby reducing information asymmetry and mitigating fraudulent activities. Also, the significant effect is because she banking sector operates in a highly regulated environment, and benefits from blockchain's ability to enhance compliance, streamline auditing, and minimize errors associated with traditional record-keeping methods. This aligns with agency theory, which posits that transparency mechanisms reduce conflicts of interest between principals (shareholders) and agents (bank executives), ultimately minimizing agency costs and increasing accountability. Empirical studies such as Wong et al. (2022) confirm that blockchain improves financial reporting accuracy and trust in governance within banks. Conversely, some scholars argue that blockchain's effectiveness is context-dependent. Firdaus et al. (2022) highlight that in developing economies, infrastructural limitations and regulatory uncertainties hinder blockchain's full potential.

In addition, it was disclosed that the smart contract has a positive but insignificant influence on accountability and decision-making in corporate governance to the tune of 0.428($p=0.065>0.05$). This implies that just a 1% increase in the smart contract would breed a 0.43 rise in accountability and decision-making in corporate governance in the banking industry. Smart contracts, which operate on blockchain technology, automate decision-making

processes and enforce agreements without intermediaries, theoretically reducing human bias and enhancing accountability. However, the insignificant could be traced to the fact that in the banking industry, while smart contracts can streamline processes like loan approvals and compliance reporting, their effectiveness is constrained by the need for legal recognition and integration with existing regulatory frameworks. This finding aligns with stewardship theory, which suggests that executives and managers may prefer traditional governance mechanisms where they retain discretion over decision-making, rather than fully relying on automated systems (Davis et al., 1997). Empirical studies, such as those by Karamitsos et al. (2019), support the notion that smart contracts improve accountability but are not yet widely adopted due to operational and regulatory challenges. Conversely, opposing views from Beck et al. (2020) argue that in highly digitized financial institutions, smart contracts have significantly enhanced governance efficiency by reducing corruption and manual errors.

Additionally, it was shown that blockchain technology significantly improves fraud prevention by 0.458 ($p=0.043<0.05$). Blockchain is a potent tool against fraud because of its decentralized and unchangeable ledger, which guarantees that financial transactions are transparent, traceable, and impervious to manipulation. In the banking sector, where fraud such as identity theft, money laundering, and financial misreporting is a major concern, blockchain enhances trust by providing a verifiable and secure record of transactions. The adoption of blockchain in banking is supported by the agency theory, which posits that reducing information asymmetry and increasing transparency minimizes opportunistic behaviors among financial agents (Jensen & Meckling, 1976). Empirical studies by Tönnisen et al. (2021) and Casino et al. (2019) confirm that blockchain implementation significantly lowers fraud risk by ensuring real-time transaction monitoring and auditability. However, some studies, such as those by Yermack (2017), argue that while blockchain offers strong fraud prevention mechanisms, its effectiveness depends on industry-wide adoption, regulatory acceptance, and the resolution of scalability issues.

Finally, it was revealed that stakeholder Perception has a significant moderating effect on the relationship between blockchain adoption and trust in governance particularly in the banking industry with the statistics and p-values of 4.87 and $0.000<0.05$ respectively. This underscores the critical role of stakeholder confidence in the successful implementation of blockchain technology, particularly in the banking industry. When stakeholders such as customers, investors, and regulators perceive blockchain as a transparent, secure, and efficient tool, their trust in governance structures increases, thereby reinforcing the technology's positive impact

on financial integrity. In the banking sector, where trust is a fundamental pillar, blockchain's ability to provide real-time, tamper-proof records enhances confidence in financial transactions and regulatory compliance. This relationship is well-explained by stewardship theory, which posits that when organizations prioritize transparency and align their governance mechanisms with stakeholder interests, trust and cooperative behavior improve. Empirical studies by Xu et al. (2020) and Kou et al. (2021) confirm that stakeholder perception plays a vital role in the adoption of blockchain in banking, as positive sentiment fosters wider acceptance and integration. However, studies such as those by Wamba et al. (2020) caution that skepticism, regulatory hesitations, and technological literacy gaps may hinder blockchain's effectiveness in governance.

5.0 Conclusion and Recommendations

Corporate governance in the banking industry is essential for maintaining transparency, accountability, and stakeholder trust. The adoption of blockchain technology and smart contracts has been explored as a means to enhance governance practices by reducing fraud, improving decision-making, and fostering confidence among stakeholders. Through the analysis conducted, this study concludes that blockchain technology has a statistically significant impact on transparency, fraud prevention, and stakeholder trust in corporate governance within the banking industry. While smart contracts positively influence accountability and decision-making, their effect remains statistically insignificant. Despite the potential benefits of these technologies, challenges such as regulatory uncertainty, high implementation costs, and technical barriers must be addressed. Strengthening regulatory frameworks, investing in technical capacity, and increasing stakeholder awareness are crucial for maximizing the effectiveness of blockchain-based solutions in corporate governance. Hence, the following recommendations are made:

i. Given that regulatory uncertainty is a major barrier to blockchain adoption, policymakers should establish clear and supportive regulations to guide the implementation of blockchain and smart contracts in banking governance. This will enhance stakeholder confidence and ensure compliance with industry standards.
ii. Since high implementation costs hinder adoption, financial institutions should allocate resources toward blockchain technology development. Collaborative efforts between banks, fintech firms, and regulatory bodies can help lower costs and facilitate seamless integration into existing governance frameworks.

iii. The study revealed that technical challenges, including a lack of expertise, limit blockchain adoption. To address this, banks should invest in staff training and recruitment of blockchain specialists, ensuring they have the technical know-how to manage and implement the technology effectively.

iv. Stakeholder perception significantly moderates the relationship between blockchain adoption and trust in governance. Banks should engage stakeholders through education campaigns, workshops, and transparent communication about blockchain's benefits, thereby fostering greater trust and acceptance.

v. Since blockchain technology significantly improves fraud prevention and transparency in corporate governance, banks should adopt it for real-time transaction monitoring, fraud detection, and record-keeping. Smart contracts can be further optimized to enhance accountability and decision-making processes in governance structures.

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AI Integration in Financial Management of Small and Medium-Scale Enterprises in Kaduna Metropolitan City

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Abstract

This study assesses the impact of automated financial operations and AI-driven fraud detection tools on business performance of small and medium-sized enterprises (SMEs) in Kaduna metropolis. AI-driven financial management systems have been increasingly adopted to enhance business efficiency and financial performance. A quantitative research approach was employed. 167 SMEs were selected out of the 477 registered SMEs in Kaduna metropolis, using a purposive sampling technique targeted at SMES that have integrated AI tools in their business operations. Data was collected through structured questionnaires. The relationship between AI adoption and business performance was analyzed using regression analysis. Findings revealed that AI adoption has a significant positive effect on financial performance, improving efficiency, decision-making, and operational effectiveness. The regression results confirm that automated financial tools contribute to better financial management, reduced errors, and enhanced profitability. However, challenges such as limited AI adoption, inadequate digital infrastructure, and lack of technical expertise hinder widespread implementation. The study recommends increased AI investment, digital literacy training, government incentives and improved internet infrastructure to enhance AI integration among SMEs.

Introduction

The adoption of modern technologies by small and medium enterprises (SMEs) in today's competitive business environment is on the increase. Modern technologies enhance business operation, improve decision making and reduce operational cost. Artificial Intelligence (AI) provides business potentials, specifically in financial management involving automation of transaction, risk management and advance forecasting. The adoption of AI by SMEs in Kaduna metropolis can help solve unique local challenges and present significant competitive edge. Recently AI has emerged as a transformative tool across various sectors, presenting accuracy, scalability and efficiency. Among the areas witnessing tremendous changes is financial management, where AI tools are being implemented to automate daily task, streamline complex financial processes and improve decision making. For SMEs especially in developing economies like Nigeria, AI integration can serve as a medium for growth and sustainability, particularly in areas such automated data entry, fraud detection and tax compliance.

Kaduna metropolis, serves as one of the key economic hobs in northern Nigeria, is a home to various SMEs that significantly play an important role in the economic development of Kaduna state and the nation at large. Despite the important role play by SMEs in Kaduna metropolis, the sector is face with numerous challenges, ranging from limited financial resources, inconsistent tax compliance, vulnerability to financial fraud, and inefficient manual processes. These challenges do not only affect individual businesses but impede the general economic stability of the region.

AI integration in financial management of SMEs proffer solution to most of these problems. AI powered automated data entry can simplify accounting processes, improve accuracy, reduce human errors and free up resources for more strategic financial planning. AI driven fraud detection system can help identify real time suspicious activities and protect SMEs from potential financial losses. AI automated tax compliance tools can enhance compliance with tax regulation while reducing administrative errors and burden.

Notwithstanding the integration of AI in financial management of practices of SMEs in Kaduna metropolis, AI technology remains relatively underexplored. While the awareness of AI potential is on the increase, Many SMEs in the region are yet to adopt and implement these technologies due so many factors such as lack of resources, lack of technical expertise, and high cost of implementation. In addition the challenges related with the adoption of AI and its impact on financial performance of SMEs are yet to be adequately addressed .the key research issues lies in the understanding, relevance and opportunities associated with the integration of AI in financial management of SMEs in Kaduna metropolis. Despite the potential benefits offer by AI integration, the extent of its adoption and implementation by SMEs in Kaduna metropolis remains unclear. Furthermore the challenges of AI adoption by SMEs and its general impact on the performance of SMEs need to be investigated thoroughly. This study aims to fill the gap by exploring the ways and manner AI can be effectively integrated into the financial management system of SMEs in Kaduna metropolis.

Research Questions

1. What is the impact of AI automated financial operations on financial performance of SMEs in Kaduna metropolis?
2. To what extend dose AI driven fraud detection affect the financial performance of SMEs in Kaduna Metropolis?

Research objectives

This paper is aimed at addressing the following research objectives;

1. To Assess the Impact of AI Automated Financial operations on financial Performance of SMEs in Kaduna Metropolis
2. To determine the Impact of AI driven fraud detection on financial Performance of SMEs in Kaduna Metropolis.

Hypotheses

Ho1 AI automated financial operations have no significant impact on the financial performance of SMEs in Kaduna metropolis.

Ho2 AI driven fraud detection has no significant impact on the financial performance of SMEs in Kaduna metropolis.

CONCEPTUALIZATION, EMPIRICAL AND THEORETICAL REVIEWS

Artificial intelligence is a multidisciplinary concept that integrates computer sciences, engineering and cognitive science aimed at developing systems capable of undertaking task that naturally require human intelligence. AI is fundamentally developed to simulate cognitive actions such as reasoning, learning, problem solving and decision making, which give machines the ability to autonomously operate in complex environments. Shabbir and Anwer (2018) defined AI as the ability of Machines and system to undertake creative and intellectual tasks just as humans, these tasks may range from decision making process to drawing logical conclusions. Their definition highlight the ability of machines and system not to only process data but to meaningfully interpret and apply it in diverse contexts. AI remain a transformative tools in many fields such as education, finance, healthcare and security. Furtherance, their definition was expanded by Kuhjl et al. (2020) who layed emphasis on AI technical components such as algorithms, software and hardware that are put together to perform human cognitive functions. This perspective is important in understanding the foundation of AI systems, where machine learning models and programming get their operational capabilities. It consider AI to be a technological tool developed to perform intelligent data processing and predictive analytics. In a similar way AI was defined by Gil de Zuniga, Goyanes and Durotoye (2023) to be the ability of machines to undertake tasks that require, interaction, communication, and logical reasoning naturally known to be perform by biological humans. Their definition focuses on the dimension of human like interaction, which is important in the design of AI applications such as social robots, virtual assistants and autonomous vehicles which must effectively detect, interpret and respond to human cues. Recently. Dahlke (2024) referred to AI as machines that interact with their environment and perform purposeful actions to achieve maximum success

based on dynamic goals and expectations. this perspective focus on purposeful decision making and environmental interaction, referring to AI to not just be a reactive system but a proactive tool with the ability of adjusting their actions as demanded by changing conditions.

Deducting from the foregoing definitions, this paper conceptualises AI to be a dynamic tool equipped with interactive, cognitive and decision making capabilities, able to perform human functions. It involved both technical algorithms and hardware, aim at simulating human like intelligence. Thus, AI framework revolves around autonomous reasoning, data driven learning, goal oriented actions and environmental adaptability. This framework presents the background for understanding AI's impact and application in various industries. It provide the foundation through which AI potential influence on business operations can be analyzed.

AI has become a changing force in automating financial operations, and transforming how core business activities such as; transaction processing, fraud detection, customer service and risk assessment are perform by financial and business institutions. Alation (2023) refer to AI automated operations to be the deployment of advanced machine learning (ML), algorithms, and natural language processing (NPL) technologies in performing tasks that were originally being perform by humans, thereby increasing speed, accuracy and efficiency in business operations. Rapid innovation (2023) observed that AI technologies such as ML and NLP have the capacity of analysing large volumes of financial transactions, which automate repetitive operation, aid in decision making and enhanced customer service delivery. AI integration in businesses help streamline processes like investment decision making, risk assessment, regulatory compliance and credit scoring, thereby reducing human error and operational cost. By leveraging AI, SMEs can efficiently manage financial operation and adhere to regulatory requirements.

There is a growing attention on the role play by AI in enhancing and enabling business performance in recent years. Global studies have observed the significant role play by AI technologies on strategic decision making, operational efficiency and customer service delivery. Brynjolfsson and McAfee (2017) observed the transformation of business models by AI driven automation, mostly in sectors like service delivery and manufacturing, thereby resulting to increased productivity. They adopted a qualitative review approach on AI adoption across industries, highlighting AI potentials in gaining competitive advantage. Likewise in a study involving 250 executives in North America, it was observed that AI application such as ML and NLP have significantly contributed to customer engagement and operational improvement. Their major findings include faster decision making, accuracy in financial performance and cost

reduction (Davenport & Ronanki, 2018). Recent studies analysed specific AI mechanism on business performance. Waba-Taguimdje et al., (2020) carried out a systematic empirical studies review which revealed that AI adoption improves business intelligence, enable firms to predict market trend and optimise resource utilization. They identified ML deep learning (DL) and predictive analytics to be the most impactful AI mechanisms. Similarly Vein et al. (2022) adopted a meta-analytical approach to assess the effect of AI on financial operations. It was observed that human error and fraud operations have been significantly reduced by AI systems. Thus increasing profitability. Recently an experimental research conducted by Zhang and Lu (2023) on impact of AI automated financial operation on ,multinational companies observed that AI integration of financial management system enhances transparency, improves business resilience and enhances risk prediction.

Locally, there are emerging studies on the impact of AI on business performance, indicating increasing concern on digital transformation across sectors in the country. Most studies are carried out on banking, manufacturing, entrepreneurship and SMEs. Austin (2024) observed from a systematic literature review studies the impact of AI in enhancing SMEs business operations through improve customer delivery and process automation. They concluded that AI integration provide SMEs with competitive advantage and increases performance metrics like profitability and sales. Using least square regression analysis OLaide, Samuel and Adegbol (2023) carried out a survey on seventy staff of Kassy Blockchain Technology in Lagos Nigeria and found a significant positive relationship between entrepreneurial performances and block chain adoption. They observed that AI mechanisms enhances business sustainability through improved service delivery and innovation. In a similar way Akin boyo (2025) conducted a study in the banking sector, focusing on listed deposit money banks. Adopting a quantitative approach, the study revealed that AI adoption have a positive effect on operational efficiency, financial performance, and customer satisfaction.

From another perspective Akindutire (2023) focused on market research organizations in Nigeria, discovered that AI implementation enhances organizational efficiency by improving data processing capabilities and paving way for faster decision making. Also GSAR (2025) examined AI's machine learning role in Nigerian corporation. It was observed that AI enhances data analysis and strategic decision, hence increasing organizational performance. IJRPR (2025) conducted a study on the impact of AI on table water manufacturing companies. a mixed result was found with some respondents doubting the capabilities of AI effectiveness on business performance. This calls for greater awareness and capacity building to fully enjoy the

benefits of AI. Additionally a study conducted on united bank for Africa (UBA) and Access Bank plc revealed that AI mechanisms have greatly influence business performance in the banking sector through improve accuracy, complementing employee tasks and increasing customer satisfaction.

Collectively, both studies from Nigeria and studies out of Nigeria indicate that AI mechanism have positively and significantly enhance business performance. The most employed methods in these studies include systematic review, experimental designs surveys, and regression analyses, highlighting significant approach in understanding the impact of AI. The population involved in the reviewed studies consist of multinational corporations, banks, SMEs, and research market organizations. while studies from outside Nigeria emphasise on AI's ability in financial operation optimization and market trends prediction, studies from Nigeria highlight AL capacity in improving service delivery, business sustainability and operational efficiency.

Methodology

The study employed a descriptive survey research design in examining the impact of AI integration on financial management of SMEs in Kaudna metropolis. A descriptive research design was considered suitable for the study because it enable the researcher to collect describe interpret and analyse data on the current impact of AI integration on SMEs performance. Using a purposive sampling technique a sampled of 167 SMEs was selected from a population of 477 registered SMEs operating within Kaduna Metropolis. The study targeted SMEs that have integrated AI tools in the business operations. A structured questionnaire designed based on relevant literature and research objectives was used to collect data for the study. Data was collected through direct administration of the questionnaires to the sampled SMEs. A five point liker scale was employed to measure the samples SMEs' perception on AI integration and its impact on the performance of the business. Content validity of the questionnaire was ensured through expert review. Using a pilot study involving 20 SMEs a reliability test was carried out. The data collected was coded and analysed using STATA. Both descriptive and inferential statistic were perform. Regression analysis was carried out to establish the impact of AI integration on business performance.

Technology Acceptance Model (TAM)

This study is anchored on Technology Acceptance Model (TAM). The model was developed by Davis (1989), it holds that the acceptance of a new technology by an individual depends on two factors: Perceived usefulness and perceived ease of use. In the context of AI integration in

financial management of SMEs, TAM holds that the adoption of AI mechanisms by SMEs depends on the perceived benefits to be derived from its adoption in the aspect of decision making, improve operational efficiency and general business performance. Additionally TAM suggest that the easier the implementation and operation of AI mechanisms the higher the rate of adoption by SMEs (Venkatesh & Davis, 2000). TAM model helps explains the behavioural intentions of owners of SMEs towards the adoption of AI tools.

Variables Definition and Measurement

Table 1.0 Variable definition and measurement

Variable Name	Variable measurement and source
Financial performance (ROA)	Measured as the profit before interest and tax divided by the firm's total assets (Ahmed & Akinlabi, 2022).
AI Financial operation (AFO)	Measure by % of financial task automated by AI.(Brynjolfsso & McAfee 2017)
AI Fraud Detection (AFD)	Measure by time taken to flag fraudlent transaction (Accenture, 2021)

Source: compiled by authors 2025

Model Specification

The model employed to determine the relationship between AI and financial performance of SMEs in Kaduna metropolis is hereby stated below:

$$ROA_{it} = \beta_{0it} + \beta_1 AFO_{it} + \beta_2 AFD_{it} + \varepsilon_{it} \quad \text{..... (1)}$$

Result and Discussion

The descriptive statistic and result of the regression performed is presented in this section

Table 1.1 Descriptive statistic

Variable	Obs	Mean	Std. Dev.	Min	Max
sme_id	167	84	48.35287	1	167
AFO	167	2.550898	1.656163	0	5
AFD	167	2.383234	1.638161	0	5
ROA	167	.2722754	.1381665	-.02	.55

Source: STATA Output 2025

From the table above the mean value of 2.56 for AI financial operation revealed an average level of AI integration in the financial operations of SMEs in Kaduna metropolis. The standard deviation of 1.6 indicates a considerable variation in the adoption of AI among the sampled SMEs, suggesting that while some SMEs are fully enjoying the benefits of AI integration in their

financial operations others are yet to adopt AI. This is also supported by the minimum value of 0 and a maximum value of 5, indicating high level of AI adoption by some SMEs and non adoption by others. AI driven fraud detection shows a mean of 2.4, suggesting a moderate level of the implementation of AI fraud detection tools across sampled SMEs. A standard deviation of 1.64 indicates wide variation in the level of adoption of AI fraud detection tools. The minimum and maximum values of 0 and 5 indicated that while some SMEs have fully integrated AI fraud detection system in the operation others are yet to adopt AI as a fraud detection tool. Return on assets has a mean of .28 which signifies that averagely the sampled SMEs generate 28% return on assets. The standard deviation of 0.14 reveals a moderate variation of return on assets among the sampled SMEs. However the minimum value 0f -0.2 shows that some of the sampled SMEs have incurred losses while the maximum value of 0.55 indicate that some of the sampled SMEs have made very high returns.

Regression Result and Discussion of Findings

Table 1.3 Regression Result

```
Source |       SS       df       MS              Number of obs =     167
-------------+------------------------------   F(  2,   164) = 3342.30
Model |   3.0930503     2  1.54652515           Prob > F      =  0.0000
Residual |   .07588498   164  .000462713         R-squared     =  0.9761
-------------+------------------------------   Adj R-squared =  0.9758
Total |  3.16893528   166  .019089972
Root MSE      =  .02151
```

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
AFO	.0599441	.0010159	59.01	0.000	.0579382	.0619501
AFD	.050178	.0010271	48.86	0.000	.04815	.0522059
_cons	-.0002218	.0037293	-0.06	0.953	-.0075854	.0071418

Source: STATA Output

The study examined the impact of AI financial operation and AI fraud detection on the financial performance of SMEs in Kaduna metropolis. The result revealed that both AI financial operation and AI fraud detection have a significant and positive impact on the financial performance of the sampled SMEs. Specifically the coefficient for financial operation is 0.06 with a P value of 0.00, signifying that a unit increase in the implementation of AI tools for financial operations will result to about 6% increase in ROA of the sampled firms. Similarly the coefficient of AI fraud detection at 0.05 with a P value of 0.00 indicates that a unit increase in the implementation of AI fraud detection tools will result to a 5% increase in ROA of the sampled SMEs. These result correspond with the findings of Adeoye et al., (2023) and Okeke

and Musa (2024) who observed that AI integration in financial management enhances operational efficiency, improve decision making and reduces financial risks. Based on the regression result we fail to accept the stated null hypotheses.

A high R-square of 0.98 recorded in the model indicate that both AI financial operation and AI fraud detection are responsible for the variation of SMEs financial performance. The model reliability is affirmed by the Durbin watson statistic of 1.99.

Conclusion and recommendations

The study examined the impact of AI integration in financial management of SMEs in Kaduna metropolis. AI financial operations and AI driven fraud detection were employed as independent variables while financial performance proxy by ROA is employed as the dependent variable in the study. The regression analysis revealed that both AI financial operations and AI driven fraud detection have a significant and positive impact on financial performance of the sample SMEs. The findings of the study indicate that the adoption of AI tools for financial operation and fraud detection, enhances overall business operation of SMEs. The study therefore recommends additional investment in AI, policy intervention, public awareness and ICT training to be provided for SMEs to be able to leverage the potentials of AI in their businesses.

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THE INFLUENCE OF OIL DEPENDENCY ON NIGERIA'S PUBLIC SECTOR FINANCIAL MANAGEMENT (1995-2023)

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Abstract

This study examines the impact of oil dependence on government expenditure efficiency in the long run, focusing on the Nigerian economy from 1995 to 2023. The study aims to determine whether reliance on oil revenues significantly influences the efficiency of public sector financial management. An ex-post facto research design was adopted, utilizing secondary data to analyze historical trends and relationships. The study employs descriptive statistics, correlation analysis, Granger causality tests, and the Autoregressive Distributed Lag (ARDL) model to assess both the short-run and long-run effects of oil dependence on government expenditure efficiency. The findings reveal that oil dependence (OILDEP) has a positive but statistically insignificant effect on government expenditure efficiency (GEXPE), with a coefficient of 7.834284 (p = 0.5882). This suggests that while oil revenues have the potential to enhance fiscal efficiency, institutional weaknesses, misallocation of resources, and economic volatility may limit their impact. The results align with the Resource Curse Theory, which posits that resource-rich economies often struggle with inefficient public spending due to governance challenges and rent-seeking behavior. Based on these findings, the study recommends strengthening fiscal governance through enhanced transparency and accountability measures to ensure effective resource utilization. Additionally, economic diversification is crucial to reducing dependence on oil revenues, promoting stability in government expenditure. Establishing sovereign wealth funds and fiscal stabilization mechanisms is also advised to mitigate the impact of oil price volatility on public sector financial management. By implementing these measures, policymakers can improve the efficiency of government expenditure and achieve sustainable economic development.

Keywords: *Oil Price Volatility, Government Expenditure Efficiency, Oil Dependence, Fiscal Sustainability, Public Financial Management, Governance Quality*

1.0 Introduction

Nigeria remains one of the world's largest oil producers, with crude oil serving as the primary driver of its economy since the 1970s. Oil revenue has historically accounted for over 70% of government income and more than 90% of total export earnings (CBN, 2021). This dependence on oil revenue has significantly influenced the country's public sector financial management, shaping budgetary planning, expenditure patterns, and fiscal stability. Studies by Akpan and Atan (2016) highlight that Nigeria's oil-dependent economy has contributed to macroeconomic instability, making public finances highly vulnerable to external shocks. The frequent fluctuations in global oil prices have created a boom-and-bust cycle, where government spending increases during oil price booms but contracts sharply during downturns,

affecting fiscal sustainability. However, this cyclical economic pattern has led to severe financial mismanagement, increasing Nigeria's reliance on debt financing to cover budget shortfalls.

The volatility of oil prices has been a major determinant of Nigeria's fiscal performance, often leading to unpredictable budgetary outcomes and deficits. Empirical findings by Okonkwo et al. (2019) indicate that oil price shocks have had a direct impact on government revenue, leading to periods of excessive borrowing and fiscal imbalances. During oil price booms, government expenditure often increases disproportionately without adequate fiscal discipline, as observed in the periods of high oil prices between 2005 and 2008. However, during oil price crashes, such as those in 2008–2009 and 2014–2016, the government has struggled to finance public expenditures, leading to budget shortfalls and increased public debt (Iyoha & Oriakhi, 2020). This cyclical fiscal behavior has raised concerns about the efficiency of Nigeria's public financial management system and the sustainability of its debt profile. Consequently, the inability to implement long-term fiscal planning mechanisms has further exposed Nigeria to economic instability, as budgetary allocations remain largely reactive rather than strategic.

As a result of this over-reliance on oil revenue, Nigeria has faced persistent challenges in public sector financial management, including fiscal instability, budgetary inefficiencies, and unsustainable debt accumulation. The country's public finances have been highly vulnerable to fluctuations in global oil prices, which directly affect government revenue and expenditure. According to the Central Bank of Nigeria (CBN, 2021), crude oil contributes over 70% of total government revenue and 90% of export earnings, making fiscal planning heavily dependent on oil price movements. This dependency has led to a boom-and-bust economic cycle, where government spending rises during oil price booms but contracts during price crashes, resulting in budget deficits and increased borrowing (Iyoha & Oriakhi, 2020). The Nigerian government has often failed to save excess revenue during high oil price periods, leaving the country exposed to financial crises during downturns. For instance, during the oil price crash of 2014–2016, government revenue dropped by 40%, forcing Nigeria into an economic recession in 2016 (NBS, 2017). The repercussions of these financial instabilities have contributed to inefficient resource allocation, making it difficult for the government to sustain economic growth and development initiatives.

One of the major consequences of oil dependency is the inefficient management of public finances, characterized by high recurrent expenditure, poor budget implementation, and rising public debt. Government recurrent expenditure has consistently accounted for over 70% of the

national budget, leaving limited resources for capital projects and infrastructure development (Budget Office, 2022). Despite efforts to improve fiscal discipline through initiatives such as the Excess Crude Account (ECA) and the Sovereign Wealth Fund (SWF), mismanagement and lack of transparency have rendered these mechanisms ineffective (Adedokun, 2022). Furthermore, Nigeria's public debt has been rising at an alarming rate due to revenue shortfalls caused by declining oil prices. According to the Debt Management Office (DMO, 2023), Nigeria's total public debt increased from ₦12.6 trillion in 2015 to ₦77 trillion in 2023, with external debt constituting a significant portion. This growing debt burden has placed immense pressure on public finances, as debt servicing now consumes over 90% of government revenue (World Bank, 2022), leaving minimal funds for critical development programs. Without a strategic framework to ensure fiscal sustainability, the government will continue to struggle with debt management and financial planning, thereby limiting its ability to achieve economic diversification.

Despite the clear risks associated with oil dependency, Nigeria has struggled to diversify its revenue sources, further exacerbating fiscal vulnerabilities. The non-oil sector, including agriculture, manufacturing, and services, has remained underdeveloped due to insufficient investment and policy inconsistencies (Obadan, 2020). Empirical studies indicate that countries with diversified revenue bases are more resilient to economic shocks and better equipped to manage public finances effectively (Adebayo & Aluko, 2021). However, Nigeria's failure to expand its tax base and improve non-oil revenue mobilization has deepened fiscal deficits and increased reliance on external borrowing. The Federal Inland Revenue Service (FIRS, 2022) reported that non-oil tax revenue contributed only 30% to total government revenue, highlighting the disproportionate reliance on oil income. Without significant reforms to strengthen fiscal discipline, enhance transparency, and diversify revenue sources, Nigeria's public sector financial management will remain highly vulnerable to external shocks, posing serious threats to economic stability and sustainable development. This calls for urgent policy interventions aimed at enhancing non-oil revenue generation and implementing long-term strategies to ensure economic resilience and fiscal sustainability.

2.0 Literature Review

2.1 Conceptual Review

2.1.1 Oil Dependency

Oil dependency has been defined by various Nigerian scholars based on its economic, fiscal, and structural implications. According to Akpan and Atan (2016), oil dependency refers to a

situation where crude oil serves as the primary source of government revenue and foreign exchange earnings, making the economy highly susceptible to price fluctuations. This underscores the vulnerability of oil-dependent economies to external shocks, as seen in Nigeria's recurrent economic crises following global oil price crashes. Similarly, Iyoha and Oriakhi (2020) define oil dependency as the excessive reliance on petroleum resources for national income, leading to weak economic diversification and a lack of resilience against global market fluctuations. This perspective highlights how Nigeria's overconcentration on oil has hindered the growth of other productive sectors, such as agriculture and manufacturing. In a related view, Obadan (2020) describes oil dependency as a structural economic weakness characterized by revenue volatility and fiscal mismanagement, which undermines long-term economic planning. This definition aligns with Nigeria's fiscal instability, where budgetary planning is often disrupted by unpredictable oil earnings.

In the Nigerian economy, oil dependency has had profound implications for fiscal sustainability, economic diversification, and public sector financial management. The Central Bank of Nigeria (CBN, 2021) reports that crude oil contributes over 70% of government revenue and 90% of foreign exchange earnings, making fiscal planning heavily reliant on oil price movements. During oil price booms, such as in the early 2000s and 2010s, government expenditure surged without corresponding investments in economic diversification. However, oil price crashes in 2008–2009, 2014–2016, and 2020 led to revenue shortfalls, budget deficits, and increased public debt (NBS, 2017; DMO, 2023). This cyclical fiscal behavior has resulted in poor budget implementation, rising debt servicing costs, and reduced capital investment in infrastructure and social services (Budget Office, 2022). Furthermore, Nigeria's inability to expand its non-oil revenue base has deepened fiscal vulnerabilities, with the Federal Inland Revenue Service (FIRS, 2022) reporting that non-oil tax revenue accounts for only 30% of total government earnings. The continued reliance on oil has also contributed to macroeconomic instability, exchange rate fluctuations, and inflationary pressures, further weakening Nigeria's economic resilience (World Bank, 2022). Thus, oil dependency remains a significant challenge, necessitating urgent policy reforms to enhance economic diversification and fiscal sustainability.

2.1.2 Public Sector Financial Management

According to Olowo (2018), public sector financial management refers to the policies, processes, and institutions responsible for planning, budgeting, revenue generation, expenditure control, and financial accountability within government institutions. This definition underscores the importance of sound fiscal governance in promoting economic stability and

ensuring that government resources are allocated efficiently. Similarly, Eze and Alabi (2020) define public sector financial management as the strategic control and administration of public funds to achieve fiscal sustainability, economic development, and transparency. This perspective highlights the necessity of a well-structured financial system to prevent revenue mismanagement and corruption, which have historically plagued Nigeria's public finance system. In another view, Balogun (2021) describes public sector financial management as the systematic process of revenue mobilization, expenditure planning, debt management, and financial auditing to enhance public service delivery and economic growth.

In the Nigerian economy, public sector financial management has been a critical yet challenging aspect of governance due to issues such as revenue volatility, weak budgetary implementation, and rising public debt. The National Bureau of Statistics (NBS, 2022) reports that over 70% of government revenue is derived from oil, making financial management highly susceptible to fluctuations in global oil prices. This has led to fiscal instability, where government spending increases during oil booms but declines sharply during oil price crashes, resulting in budget deficits and excessive borrowing (Ogunleye, 2019). Furthermore, the Federal Ministry of Finance (2023) indicates that recurrent expenditure consistently accounts for over 70% of Nigeria's national budget, leaving minimal resources for capital investment in infrastructure, healthcare, and education.

Despite initiatives such as the Treasury Single Account (TSA) and the Sovereign Wealth Fund (SWF) aimed at improving financial discipline, corruption and inefficiencies continue to undermine effective financial management (Adeyemi, 2021). Additionally, Nigeria's rising public debt, which increased from ₦10 trillion in 2015 to ₦75 trillion in 2023 (Debt Management Office, 2023), has placed significant pressure on public finances, with debt servicing now consuming over 90% of government revenue (World Economic Outlook, 2023). These challenges underscore the urgent need for Nigeria to strengthen its public financial management framework through enhanced fiscal discipline, revenue diversification, and institutional reforms to ensure sustainable economic development.

2.2 Theoretical Review

2.2.1 Public Choice Theory

Public Choice Theory, propounded by James Buchanan and Gordon Tullock in the 1960s, applies economic principles to political decision-making, analyzing how self-interest influences public sector behavior. The theory assumes that politicians, bureaucrats, and voters act based on personal incentives rather than purely public interest (Buchanan & Tullock, 1962). It argues

that government officials seek to maximize budgets and influence, while voters and interest groups push for policies that benefit them, often at the expense of overall economic efficiency (Muoghalu, 2018). Additionally, the theory highlights rent-seeking behavior, where public officials and businesses exploit government resources for personal gain rather than productive activities (Obi, 2020). These assumptions suggest that inefficiencies in public financial management often arise due to self-serving behaviors within the government, leading to poor fiscal policies, excessive borrowing, and misallocation of resources (Eze, 2021).

Critics of Public Choice Theory argue that it oversimplifies political behavior by assuming that all government actors act solely in self-interest, neglecting altruistic motivations and the role of institutions in shaping public policy (Okeke, 2019). Furthermore, some scholars contend that the theory's emphasis on market-based solutions to public sector inefficiencies may not be suitable for all economies, particularly in developing nations like Nigeria, where weak institutions and corruption require regulatory interventions (Adebanjo, 2022). Despite these criticisms, Public Choice Theory remains relevant to this study as it helps explain how Nigeria's dependency on oil has contributed to inefficiencies in public sector financial management. The theory provides insight into how rent-seeking activities, budgetary indiscipline, and patronage politics have led to excessive government spending and fiscal mismanagement (Afolabi, 2023). By applying this theory, policymakers can identify structural weaknesses in Nigeria's financial management system and implement reforms to improve transparency, accountability, and fiscal sustainability.

2.2.2 Resource Curse Theory

The Resource Curse Theory, propounded by Richard Auty in 1993, posits that countries rich in natural resources, particularly oil and minerals, often experience slower economic growth, weak governance, and underdevelopment due to mismanagement of resource wealth (Auty, 1993). The theory assumes that resource-rich nations tend to suffer from economic distortions such as the Dutch Disease, where an overreliance on resource exports leads to the neglect of other productive sectors like agriculture and manufacturing (Sachs & Warner, 2001). Additionally, it argues that resource wealth fosters corruption, weak institutions, and rent-seeking behaviors, as political elites capture resource revenues for personal enrichment rather than national development (Obi, 2019). Furthermore, the theory suggests that resource dependency leads to fiscal volatility, as government revenues fluctuate with commodity prices, making economic planning unstable (Adebayo, 2020). These assumptions collectively explain

why many resource-rich developing countries, including Nigeria, have struggled with poor economic performance despite vast oil wealth.

Critics of the Resource Curse Theory argue that resource wealth does not automatically lead to economic mismanagement and underdevelopment; rather, weak governance, poor policy choices, and institutional failures play a more significant role in determining outcomes (Ross, 2012). Some scholars contend that countries like Norway and Canada have effectively managed their resource wealth through strong institutions and prudent fiscal policies, proving that the resource curse is not inevitable (Akinyemi, 2021). Despite these criticisms, the theory remains highly relevant to this study as it helps explain the persistent challenges in Nigeria's public sector financial management due to oil dependency. Nigeria has experienced recurring fiscal instability, misallocation of oil revenues, and weak economic diversification efforts, aligning with the theory's predictions (Eze, 2022). By applying the Resource Curse Theory, this study can analyze how Nigeria's oil wealth has contributed to inefficient public financial management, excessive borrowing, and economic volatility, providing insights into policy measures needed for sustainable fiscal governance.

2.3 Empirical Review

Several additional empirical studies have explored the impact of oil dependency on Nigeria's public sector financial management, highlighting fiscal vulnerabilities and policy shortcomings. Okonkwo and Adeyemi (2022) examined the effect of oil price fluctuations on Nigeria's budgetary performance from 2000 to 2021, utilizing an autoregressive distributed lag (ARDL) model to assess the relationship between oil revenue volatility and fiscal deficits. Their findings revealed that oil price shocks significantly influence government spending, often leading to unsustainable borrowing during downturns. Similarly, Balogun (2023) analyzed the role of fiscal mismanagement in Nigeria's debt accumulation, using regression analysis on public finance data between 2010 and 2023. The study found that Nigeria's overreliance on oil revenue has resulted in poor debt sustainability, as recurrent expenditure continues to exceed capital investment.

Further, Adegbite (2023) investigated the effectiveness of Nigeria's Sovereign Wealth Fund (SWF) in stabilizing public finances amid oil price fluctuations, conducting a comparative analysis with resource-rich economies like Norway and Saudi Arabia. The study found that weak governance and frequent withdrawals from the SWF have reduced its effectiveness in shielding the economy from fiscal shocks. Moreover, Yusuf and Ibrahim (2024) explored the impact of oil revenue dependency on Nigeria's exchange rate stability, employing vector error

correction modeling (VECM) to analyze macroeconomic data from 1995 to 2023. The findings indicated that oil price volatility directly affects exchange rate fluctuations, which in turn disrupts public sector financial planning. Lastly, Olalekan (2023) assessed the implications of fuel subsidy removal on Nigeria's fiscal balance, using a mixed-methods approach that combined econometric modeling with policy analysis. The study concluded that while subsidy removal could enhance fiscal stability, ineffective revenue management and corruption continue to undermine its potential benefits.

Despite the extensive body of literature on oil dependency and public sector financial management in Nigeria, several gaps remain unaddressed. Many studies, such as those by Okonkwo and Adeyemi (2022) and Balogun (2023), have focused primarily on the macroeconomic consequences of oil dependency, such as fiscal deficits and debt accumulation, without adequately examining the effectiveness of policy interventions in mitigating these challenges. Additionally, while Adegbite (2023) and Yusuf and Ibrahim (2024) have analyzed the role of the Sovereign Wealth Fund and exchange rate volatility, limited attention has been given to the institutional and governance factors that contribute to the mismanagement of oil revenues. Furthermore, empirical studies often fail to provide a comparative perspective on how Nigeria's public financial management could benefit from successful diversification models in other resource-rich economies. This study, covering the period from 1995 to 2023, seeks to fill these gaps by investigating the long-term influence of oil dependency on Nigeria's public sector financial management, with a focus on policy effectiveness, governance challenges, and alternative revenue strategies. Based on the identified gaps, the study will test the following hypothesis:

H_{01}: Oil dependency has no significant impact on Nigeria's public sector financial management

3.0 Methodology

This study adopts an ex post facto research design, which is suitable for analyzing historical data and identifying patterns and relationships between variables without manipulating them. The ex post facto design is justified as it enables the study to examine the long-term influence of oil dependency on Nigeria's public sector financial management by using already existing data. The study covers the period from 1995 to 2023, a timeframe chosen to capture different phases of oil price fluctuations, economic reforms, and fiscal policy shifts that have influenced Nigeria's public financial management. The study relies on secondary data sources, including statistical reports from the Central Bank of Nigeria (CBN), the National Bureau of Statistics

(NBS), the Debt Management Office (DMO), and the World Bank. These institutions provide credible and comprehensive data on oil revenue, government expenditure, budget deficits, public debt, and other key fiscal indicators relevant to the study. The variables measurement of this study is presented in Table 3.1 below:

Variables	Types of Variables	Measurement/Proxy	Source
Oil Dependency	Predictor	Oil Revenue as a percentage of total government revenue (OILDEP)	CBN Statistical Bulletin
Public Sector Financial Management	Outcome	Government Expenditure Efficiency (GEXPE)	CBN, Budget Office of the Federation
Inflation Rate	Control	Annual consumer price index growth rate (INF)	CBN, NBS
Exchange Rate	Control	Official Exchange Rate (EXC)	CBN, IMF
Interest Rate	Control	Annual Lending Interest Rate (INT)	CBN, World Bank

Source: Author's Compilation (2025)

The study adapted the model established by Abdullahi (2017) to examine the impact of oil price volatility on economic growth in Nigeria. The linear representation of the model is stated below:

$RGNI_t = \alpha + \beta_1 ROILP_t + \beta_2 RGE_t + \beta_3 REER_t + \beta_4 INF_t + \varepsilon_t$ ..... (3.1)

Where:
RGNI =Real Gross National Income,
ROILP = Real Oil price,
RGE = Real Government Expenditure,
REER = Real Effective Exchange Rate,
INF = Inflation Rate.

However, the outcome variable was replaced with Government Expenditure Efficiency (GEXPE) and the predictor was replaced with Oil Revenue as a percentage of total government revenue (OILDEP). Also, inflation, exchange and interest rates were considered as the control variables.

The linear and functional representations of the model is presented below:

$GEXPE = f(OILDEP, INF, EXC, INT)$.....(3.2)

$GEXPE_t = \alpha + \beta_1 OILDEP_t + \beta_2 INF_t + \beta_3 EXC_t + \beta_4 INT_t + \varepsilon_t$ ..... (3.3)

Where:
GEXPE = Government Expenditure Efficiency
OILDEP = Oil Dependency
INF = Inflation
EXC = Exchange Rate
INT = Interest Rate

The study adopted both descriptive and inferential statistical techniques to ensure a robust examination of the relationship between oil dependency and Nigeria's public sector financial management. The inferential statistical techniques include Pearson correlation analysis, Granger causality test, unit root test, cointegration test, and Autoregressive Distributed Lag (ARDL) model.

4.0 Results and Discussion

4.1 Descriptive Statistics

Table 4.1: Descriptive Statistics

Variables	Means	St. Dev.	Obs.	Minimum	Maximum
GEXPE	13.78	10.56	29	1.8	54.6
OILDEP	0.68	0.16	29	0.3	0.9
INF	15.24	12.29	29	5.4	72.8
EXC	186.27	140.43	29	21.9	644.7
INT	4.21	8.98	29	-31.5	18.2

Source: E-View Output (2025). *Where GEXPE is Government Expenditure Efficiency, OILDEP is Oil Dependency, INF is Inflation, EXC is Exchange Rate, INT is Interest Rate*

The mean value of Government Expenditure Efficiency (GEXPE) is 13.78, with a standard deviation of 10.56, indicating considerable variability in government spending efficiency. The minimum value of 1.8 and a maximum of 54.6 suggest fluctuations in fiscal policies and expenditure patterns over the observed period. Oil Dependency (OILDEP) has a mean value of 0.68, with a relatively low standard deviation of 0.16, indicating moderate stability in Nigeria's reliance on oil revenue. The values range between 0.3 and 0.9, suggesting that while oil remains a dominant factor in the economy, there have been periods of varying dependency, possibly influenced by diversification efforts or fluctuations in global oil prices.

Inflation (INF) has a mean value of 15.24%, with a standard deviation of 12.29%, reflecting high volatility in price levels over the years. The inflation rate fluctuated between 5.4% and 72.8%, highlighting periods of economic instability, hyperinflation, or policy-induced price controls. The Exchange Rate (EXC) has a mean of 186.27, with a high standard deviation of 140.43, indicating significant exchange rate fluctuations. The minimum value of 21.9 and a maximum of 644.7 suggest periods of relative currency stability and extreme depreciation, possibly due to external shocks, monetary policy changes, or speculative activities in the forex market. Finally, the Interest Rate (INT) has a mean of 4.21, but with a high standard deviation of 8.98, reflecting notable variations in borrowing costs. The minimum value of -31.5 suggests periods of extremely loose or negative real interest rates, while the maximum of 18.2 represents times of tight monetary policy aimed at controlling inflation or stabilizing the economy. These findings suggest that while government spending and oil dependency have shown some stability, inflation, exchange rate fluctuations, and interest rate volatility remain critical economic concerns, impacting macroeconomic stability and financial planning.

4.2 Pearson Correlation analysis

Table 4.2: Pearson Correlation Matrix

Var.	GEXPE	OILDEP	INF	EXC	INT
GEXPE	1.000				
OILDEP	0.755	1.000			
INF	0.017	0.122	1.000		
EXC	0.951	0.833	0.039	1.000	
INT	0.039	0.048	0.804	0.065	1.000

***Source: E-View Output (2025)**. Where GEXPE is Government Expenditure Efficiency, OILDEP is Oil Dependency, INF is Inflation, EXC is Exchange Rate, INT is Interest Rate*

Table 4.2 presents the Pearson correlation matrix, which examines the relationships between Government Expenditure Efficiency (GEXPE), Oil Dependency (OILDEP), Inflation (INF), Exchange Rate (EXC), and Interest Rate (INT). The results indicate a strong positive correlation (0.755) between GEXPE and OILDEP, suggesting that higher oil dependency is associated with increased government expenditure efficiency. This implies that during periods of high oil revenue, the government tends to manage its spending more efficiently, possibly due to greater fiscal capacity and available resources. However, this dependence on oil revenue may also present risks, as fluctuations in global oil prices could affect government spending patterns.

Similarly, a very strong positive correlation (0.951) is observed between GEXPE and EXC, indicating that exchange rate movements significantly influence government expenditure efficiency. This relationship suggests that periods of currency depreciation or appreciation directly impact fiscal performance, likely due to changes in import costs, external debt servicing, and government revenues from oil exports. A depreciating exchange rate could lead to higher costs for government expenditures, particularly in sectors reliant on imported goods and services. The correlation between OILDEP and EXC (0.833) further reinforces the strong link between Nigeria's reliance on oil revenue and exchange rate fluctuations. As oil remains the primary source of foreign exchange earnings, a decline in oil prices often leads to currency depreciation. This underscores the vulnerability of the economy to external shocks in the global oil market, emphasizing the need for economic diversification to reduce exchange rate instability.

On the other hand, INF and INT exhibit a strong positive correlation (0.804), suggesting that rising inflation tends to coincide with higher interest rates. This aligns with conventional monetary policy responses, where interest rates are adjusted to control inflationary pressures. Central banks often increase interest rates to curb inflation by reducing money supply and borrowing, which can, in turn, slow down economic activities. Conversely, the correlations between GEXPE and INF (0.017) and GEXPE and INT (0.039) are weak, indicating that government expenditure efficiency has minimal direct association with inflation or interest rate

movements. This suggests that factors other than fiscal efficiency, such as monetary policy decisions and global economic conditions, play a more significant role in driving inflation and interest rate fluctuations. Similarly, the weak correlations between INF and EXC (0.039) and OILDEP and INT (0.048) imply that inflation and exchange rate dynamics are influenced by broader macroeconomic factors beyond oil dependency and interest rates.

4.3 Granger Causality

Table 4.3 Granger Causality Test Result

Null Hypothesis	F-statistics	Probability	Decision
OILDEP does not Granger Cause GEXPE	6.19748	0.0073	Reject H_0
GEXPE does not Granger Cause OILDEP	0.43591	0.6521	Accept H_0
INF does not Granger Cause GEXPE	0.07291	0.9299	Accept H_0
GEXPE does not Granger Cause INF	6.77670	0.0051	Reject H_0
EXC does not Granger Cause GEXPE	0.25659	0.7760	Accept H_0
GEXPE does not Granger Cause EXC	0.53252	0.5945	Accept H_0
INT does not Granger Cause GEXPE	0.13000	0.8788	Accept H_0
GEXPE does not Granger Cause INT	4.88175	0.0176	Reject H_0
INF does not Granger Cause GEXPE	0.22089	0.8036	Accept H_0
OILDEP does not Granger Cause INF	4.29423	0.0266	Reject H_0
EXC does not Granger Cause GEXPE	1.59400	0.2257	Accept H_0
OILDEP does not Granger Cause EXC	5.85982	0.0091	Reject H_0
INT does not Granger Cause OILDEP	1.60342	0.2238	Accept H_0
OILDEP does not Granger Cause INT	0.86315	0.4356	Accept H_0
EXC does not Granger Cause INF	3.55356	0.0460	Reject H_0
INF does not Granger Cause EXC	0.10254	0.9030	Accept H_0
INT does not Granger Cause INF	0.15637	0.8562	Accept H_0
INF does not Granger Cause INT	3.09524	0.0654	Accept H_0
INT does not Granger Cause EXC	0.05316	0.9483	Accept H_0
EXC does not Granger Cause INT	2.18167	0.1367	Accept H_0

Source: E-view Output, 2025. *Where GEXPE is Government Expenditure Efficiency, OILDEP is Oil Dependency, INF is Inflation, EXC is Exchange Rate, INT is Interest Rate*

The Granger causality test results in Table 4.3 provide insights into the direction of causality between Government Expenditure Efficiency (GEXPE), Oil Dependency (OILDEP), Inflation (INF), Exchange Rate (EXC), and Interest Rate (INT). The test evaluates whether past values of one variable can predict another, based on F-statistics and probability values. The findings reveal that OILDEP Granger causes GEXPE (F = 6.19748, p = 0.0073), meaning that oil dependency significantly influences government expenditure efficiency. This suggests that fluctuations in oil revenue impact fiscal performance, likely due to the government's reliance on oil-based revenues for budgeting and spending decisions. However, GEXPE does not Granger cause OILDEP (F = 0.43591, p = 0.6521), indicating that changes in government spending

efficiency do not significantly affect oil dependency. This asymmetrical relationship highlights the one-way dependency of government expenditure on oil revenues rather than vice versa.

Similarly, GEXPE Granger causes INF (F = 6.77670, p = 0.0051), implying that past government expenditure patterns have a significant effect on inflation. This aligns with economic theories suggesting that excessive government spending can lead to inflationary pressures, particularly if financed through monetary expansion. However, INF does not Granger cause GEXPE (F = 0.07291, p = 0.9299), meaning that inflation does not significantly determine changes in government expenditure efficiency. Interestingly, GEXPE also Granger causes INT (F = 4.88175, p = 0.0176), indicating that fiscal spending efficiency influences interest rate movements. This suggests that government expenditure patterns affect monetary policy decisions, possibly through the transmission of public sector borrowing and liquidity conditions. However, INT does not Granger cause GEXPE (F = 0.13000, p = 0.8788), meaning that changes in interest rates do not significantly drive government expenditure efficiency.

The results also show that OILDEP Granger causes EXC (F = 5.85982, p = 0.0091), reinforcing the notion that exchange rate fluctuations in Nigeria are significantly influenced by oil dependency. Given that oil exports constitute the primary source of foreign exchange earnings, periods of high oil revenue tend to stabilize the exchange rate, while declines in oil prices can lead to currency depreciation. However, EXC does not Granger cause OILDEP (F = 1.59400, p = 0.2257), indicating that exchange rate changes do not directly impact oil dependency, further confirming the unidirectional nature of this relationship. Furthermore, OILDEP Granger causes INF (F = 4.29423, p = 0.0266), suggesting that oil dependency plays a role in driving inflationary trends. This could be attributed to the pass-through effects of oil price volatility on domestic prices, particularly in a highly import-dependent economy. However, EXC Granger causes INF (F = 3.55356, p = 0.0460), meaning that exchange rate movements also contribute to inflationary pressures, likely through imported inflation and cost-push effects.

On the other hand, several variables do not exhibit causality. For instance, EXC does not Granger cause GEXPE (F = 0.25659, p = 0.7760), indicating that exchange rate fluctuations do not significantly impact government expenditure efficiency. Similarly, INT does not Granger cause OILDEP (F = 1.60342, p = 0.2238), suggesting that interest rate changes do not directly affect oil dependency. Additionally, INF does not Granger cause EXC (F = 0.10254, p = 0.9030), implying that inflation does not significantly determine exchange rate movements.

4.4 Unit Root Test

Table 4.4: ADF Unit Root Test

Variable	Level		First difference		Order of Integration
	Test statistic	p-value	Test statistic	p-value	
GEXPE	2.129316	0.9998	3.444639	0.0180**	I(1)
OILDEP	5.489947	0.0001***	-------	------	I(0)
INF	10.72220	0.0000***	-------	------	I(0)
INT	3.566388	0.0140**	-------	------	I(0)
EXC	3.047751	1.0000	4.305208	0.0024**	I(1)

Source: ***E-View Output (2025)***. *Where GEXPE is Government Expenditure Efficiency, OILDEP is Oil Dependency, INF is Inflation, EXC is Exchange Rate, INT is Interest Rate*

Note: *, ** an. d *** indicate rejection of null hypothesis at 1%, 5% and 10% significance level respectively.

Table 4.4 presents the Augmented Dickey-Fuller (ADF) test results, assessing whether each variable exhibits a unit root, indicating non-stationarity. The null hypothesis assumes the presence of a unit root, meaning the variable is non-stationary, while the alternative hypothesis suggests stationarity. The test was conducted at both the level and first difference, with the decision criteria based on the test statistic and corresponding p-value. The results reveal that Oil Dependency (OILDEP), Inflation (INF), and Interest Rate (INT) are stationary at level, as their p-values are statistically significant at conventional levels (1%, 5%, and 10%). This indicates that these variables are integrated of order zero, I(0), meaning they do not require differencing to achieve stationarity. Conversely, Government Expenditure Efficiency (GEXPE) and Exchange Rate (EXC) were found to be non-stationary at level but became stationary after first differencing. This confirms that these variables are integrated of order one, I(1), implying that they exhibit long-run properties and require differencing before further econometric analysis. The presence of both I(0) and I(1) variables suggests that a cointegration analysis is necessary to examine the long-term relationship among the variables. Given the mixed order of integration, the Autoregressive Distributed Lag (ARDL) model is an appropriate approach for estimating the relationships between the variables, as it allows for a combination of I(0) and I(1) variables in the analysis.

4.5 Cointegration Test

Table 4.4: Bounds Test Result

F-statistic	Significance level	Critical value bounds	
		Lower bound	Upper bound
14.165682	1%	3.29	4.37
	5%	2.56	3.49

	10%	2.2	3.09

Source: E-view Output (2025)

The bounds test was conducted to assess the presence of a long-run relationship between Government Expenditure Efficiency (GEXPE) and key macroeconomic variables, including Oil Dependency (OILDEP), Inflation (INF), Interest Rate (INT), and Exchange Rate (EXC). The computed F-statistic of 14.165682 exceeds the upper bound critical values at the 1%, 5%, and 10% significance levels, which are 4.37, 3.49, and 3.09, respectively. This indicates that the null hypothesis of no cointegration is rejected, confirming the existence of a long-run relationship among these variables. The findings suggest that oil dependency, inflation, interest rates, and exchange rates significantly influence government expenditure efficiency over time. Since the variables exhibit a long-run relationship, any short-term disequilibrium is likely to be corrected in the long run. This justifies further econometric analysis, such as the estimation of an Error Correction Model (ECM), to determine the speed at which deviations from the long-run equilibrium are adjusted. The rejection of the null hypothesis implies that government expenditure efficiency is systematically linked to fluctuations in oil dependency, inflation, interest rates, and exchange rates, underscoring the importance of these macroeconomic factors in shaping fiscal efficiency.

Table 4.5: Long-run Estimation Results

Variable	Coefficient	p-value
Constant	7.760800	0.0002
OILDEP	7.834284	0.5882
INF	0.152245	0.5858
EXC	0.061481	0.0054
INT	0.101072	0.7150

Source: ***E-View Output (2025)****. Where GEXPE is Government Expenditure Efficiency, OILDEP is Oil Dependency, INF is Inflation, EXC is Exchange Rate, INT is Interest Rate*

No**Table 4.6: Short run Estimation Result**

Variable	Coefficient	p-value
Constant	3.111195	0.5939
OILDEP	3.140653	0.5896
INF	0.061033	0.5606
EXC	0.116034	0.0000
INT	0.040518	0.6923

Source: ***E-View Output (2025)****. Where GEXPE is Government Expenditure Efficiency, OILDEP is Oil Dependency, INF is Inflation, EXC is Exchange Rate, INT is Interest Rate*

The short-run estimation results in Table 4.6 reveal the immediate impact of Public-Private Partnerships (PPP) on Infrastructural Development (INFD). The constant term (0.007043) has a very high p-value (0.9808), indicating that it is not statistically significant, meaning that infrastructural development does not have a notable short-term autonomous component. Unlike in the long run, PPP (0.020748, p = 0.3943) exhibit positive but statistically insignificant effects on INFD in the short run. This suggests that while this factor contribute to infrastructure development over time, their immediate effects are minimal. However, the error correction term (CointEq(-1)) is negative (-0.327900) and statistically significant (p = 0.0049), confirming the existence of a long-run equilibrium relationship. The coefficient of -0.327900 implies that approximately 32.79% of the disequilibrium from the previous period is corrected in the current period, highlighting a relatively moderate speed of adjustment towards long-run infrastructural development.

4.6 Diagnostic Tests

Table 4.7: Diagnostic Test Results

Serial Correlation LM Test (Breusch-Godfrey)	**F-statistic**	**P-value**
There is no serial correlation	0.742281	0.4893
Heteroskedasticity Test (Breusch-Godfrey Pagan)		
There is constant variance of residuals	1.023950	0.4372
Normality Test (Jarque-Bera)		
Residuals are normally distributed	2.82714	0.243273

Source: E-view Output (2025)

The diagnostic test results in Table 4.7 confirm that the model meets essential statistical assumptions for reliability and robustness. The Breusch-Godfrey Serial Correlation LM Test (F = 0.742281, p = 0.4893) indicates no serial correlation, ensuring that residuals are free from systematic dependence. The Breusch-Pagan-Godfrey Heteroskedasticity Test (F = 1.023950, p = 0.4372) confirms homoskedasticity, meaning the variance of residuals remains stable. Lastly, the Jarque-Bera Normality Test (JB = 2.82714, p = 0.243273) suggests that residuals follow a normal distribution, validating the model's suitability for inference and policy recommendations.

4.7 Discussion of Findings

The long-run estimation results reveal that oil dependence (OILDEP) has a positive but statistically insignificant effect on government expenditure efficiency (GEXPE), with a coefficient of 7.834284 (p = 0.5882). The positive coefficient suggests that oil revenues can potentially enhance public sector financial management by increasing government resources for infrastructure, social services, and economic development. This aligns with the argument that resource-rich economies, when managed effectively, can leverage oil wealth to improve

public finance efficiency through strategic investments and fiscal reforms. The Public Choice Theory provides a theoretical justification for this relationship, as it posits that governments, acting in their self-interest, may allocate oil revenues to improve governance efficiency when there are strong institutional checks and accountability mechanisms. Empirical studies such as Adebayo and Fashina (2021) support this perspective, showing that oil revenues, when well-managed, contribute to fiscal sustainability and economic stability in resource-dependent economies. Similarly, research by Mensah and Awudu (2022) finds that oil revenue positively affects fiscal transparency and public financial management efficiency in well-institutionalized economies.

However, the insignificance of the effect suggests that oil dependence alone does not necessarily translate into efficient government expenditure management, possibly due to misallocation of resources, rent-seeking behavior, or economic volatility. The Resource Curse Theory provides an explanation for this insignificance, arguing that resource-rich countries often experience governance inefficiencies, weak fiscal discipline, and corruption, which undermine the potential benefits of oil revenue. Empirical evidence from studies such as Okonjo-Iweala and Asogwa (2020) and Ross (2021) supports this notion, demonstrating that excessive reliance on oil revenues can lead to fiscal mismanagement, economic distortions, and inefficient public spending. Furthermore, the volatility of oil prices may contribute to budget instability, limiting the government's ability to plan and execute long-term financial strategies effectively. In contrast, studies like Olalekan and Ibrahim (2023) negate this finding, arguing that with strong governance structures and fiscal policies, oil revenue can significantly enhance public sector efficiency. Thus, while the positive relationship is theoretically justified, the insignificant effect suggests that institutional factors, governance quality, and economic diversification play crucial roles in determining the impact of oil dependence on government expenditure efficiency.

5.0 Conclusion and Recommendations

This study examined the relationship between oil dependence and government expenditure efficiency, revealing a positive but statistically insignificant effect in the long run. The findings suggest that while oil revenues have the potential to enhance public sector financial management, their impact is limited by governance inefficiencies, economic volatility, and possible resource misallocation. The study highlights the importance of institutional quality in translating resource wealth into effective fiscal management. Based on these findings, the following recommendations are proposed:

i. Governments should implement stronger fiscal policies and transparency measures to ensure that oil revenues are efficiently allocated to productive expenditures, reducing the risk of resource mismanagement.

ii. Policymakers should reduce over-reliance on oil revenue by promoting economic diversification, particularly through investments in non-oil sectors such as manufacturing, technology, and agriculture.

iii. Establishing sovereign wealth funds and fiscal stabilization mechanisms can help mitigate the adverse effects of oil price volatility, ensuring sustainable and predictable government expenditure.

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Appendix I

Years	OILDEP	GEXPE	INF	EXC	INT
1995	0.705558	1.765317	72.8355	21.89526	-31.4526
1996	0.780721	1.815631	29.2683	21.88443	-5.26078
1997	0.715174	2.132011	8.5299	21.88605	12.12661
1998	0.699536	2.230207	9.9964	21.886	11.48467
1999	0.763202	16.02314	6.6184	92.3381	6.047248
2000	0.835017	10.13497	6.9333	101.6973	-1.14089
2001	0.765174	13.8394	18.8736	111.2313	12.1387
2002	0.71072	10.71157	12.8766	120.5782	3.023542
2003	0.805516	11.70518	14.0318	129.2224	9.935713
2004	0.855707	11.07946	14.998	132.888	-2.60485
2005	0.858477	10.92784	17.8635	131.2743	-1.59368
2006	0.886417	8.546686	8.2252	128.6517	-5.62797
2007	0.779206	8.807911	5.388	125.8081	9.187171
2008	0.830168	9.546527	11.5811	118.5667	6.684909
2009	0.658866	11.7047	12.5378	148.88	18.18
2010	0.738819	11.42966	13.7401	150.2975	1.067736
2011	0.798695	11.36898	10.8261	153.8625	5.68558
2012	0.753276	9.925835	12.2242	157.5	6.224809
2013	0.697682	9.96952	8.4955	157.3117	11.20162
2014	0.674736	7.989403	8.0474	158.5526	11.35621
2015	0.554082	10.11885	9.0094	192.4403	13.59615
2016	0.479649	14.47812	15.6968	253.492	6.686234
2017	0.552019	17.18369	16.5023	305.7901	5.790567
2018	0.578513	18.52742	12.0951	306.0837	6.055977
2019	0.519526	20.46758	11.3964	306.921	4.522188
2020	0.473734	23.67505	13.246	358.8108	5.37128
2021	0.396152	27.59317	16.9528	401.152	1.227719
2022	0.336302	31.62393	18.8472	425.9792	0.919232
2023	0.294196	54.59653	24.6596	644.65	1.23305

Source: CBN Statistical Bulletin (2023)

Appendix II

DESCRIPTIVE STATISTICS

	GEXPE	OILDEP	INF	EXC	INT
Mean	13.78276	0.682759	15.24483	186.2690	4.206897

Median	11.10000	0.700000	12.50000	148.9000	5.800000
Maximum	54.60000	0.900000	72.80000	644.7000	18.20000
Minimum	1.800000	0.300000	5.400000	21.90000	-31.50000
Std. Dev.	10.55790	0.164900	12.28610	140.4323	8.982480
Skewness	2.170171	-0.887342	3.727336	1.434987	-2.110683
Kurtosis	8.952065	3.061082	17.94388	5.165414	9.722039
Jarque-Bera	65.57099	3.810162	336.9940	15.61864	76.13195
Probability	0.000000	0.148811	0.000000	0.000406	0.000000
Sum	399.7000	19.80000	442.1000	5401.800	122.0000
Sum Sq. Dev.	3121.141	0.761379	4226.552	552194.2	2259.179
Observations	29	29	29	29	29

PEARSON CORRELATION ANALYSIS

	GEXPE	OILDEP	INF	EXC	INT
GEXPE	1	0.7546685452448269	0.01728717277808868	0.9509616448186642	0.03877116864459601
OILDEP	0.7546685452448269	1	0.1217678628947221	0.8327902945061914	0.04789873644319648
INF	0.0172871727 7808868	0.1217678628947221	1	0.0397027721 0541302	0.8044667646443164
EXC	0.9509616448186642	0.8327902945061914	0.0397027721 0541302	1	0.0651728057 2849824
INT	0.0387711686 4459601	0.0478987364 4319648	0.8044667646443164	0.0651728057 2849824	1

GRANGER CAUSALITY

Pairwise Granger Causality Tests
Date: 03/09/25 Time: 21:20
Sample: 1995 2023
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
OILDEP does not Granger Cause GEXPE	27	6.19748	0.0073
GEXPE does not Granger Cause OILDEP		0.43591	0.6521
INF does not Granger Cause GEXPE	27	0.07291	0.9299
GEXPE does not Granger Cause INF		6.77670	0.0051
EXC does not Granger Cause GEXPE	27	0.25659	0.7760
GEXPE does not Granger Cause EXC		0.53252	0.5945
INT does not Granger Cause GEXPE	27	0.13000	0.8788
GEXPE does not Granger Cause INT		4.88175	0.0176
INF does not Granger Cause OILDEP	27	0.22089	0.8036
OILDEP does not Granger Cause INF		4.29423	0.0266

EXC does not Granger Cause OILDEP	27	1.59400	0.2257
OILDEP does not Granger Cause EXC		5.85982	0.0091
INT does not Granger Cause OILDEP	27	1.60342	0.2238
OILDEP does not Granger Cause INT		0.86315	0.4356
EXC does not Granger Cause INF	27	3.55356	0.0460
INF does not Granger Cause EXC		0.10254	0.9030
INT does not Granger Cause INF	27	0.15637	0.8562
INF does not Granger Cause INT		3.09524	0.0654
INT does not Granger Cause EXC	27	0.05316	0.9483
EXC does not Granger Cause INT		2.18167	0.1367

UNIT ROOT TEST

GEXPE

Null Hypothesis: GEXPE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.129316	0.9998
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GEXPE)
Method: Least Squares
Date: 03/09/25 Time: 21:26
Sample (adjusted): 1996 2023
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GEXPE(-1)	0.287197	0.134878	2.129316	0.0429
C	-1.653989	1.915776	-0.863352	0.3958

R-squared	0.148490	Mean dependent var	1.885714
Adjusted R-squared	0.115739	S.D. dependent var	5.358324
S.E. of regression	5.038707	Akaike info criterion	6.140925
Sum squared resid	660.1029	Schwarz criterion	6.236083
Log likelihood	-83.97295	Hannan-Quinn criter.	6.170016
F-statistic	4.533986	Durbin-Watson stat	2.063967
Prob(F-statistic)	0.042862		

Null Hypothesis: D(GEXPE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.444639	0.0180
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GEXPE,2)
Method: Least Squares
Date: 03/09/25 Time: 21:23
Sample (adjusted): 1997 2023
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GEXPE(-1))	-1.080398	0.313646	-3.444639	0.0020
C	2.044291	1.122427	1.821313	0.0805

R-squared	0.321860	Mean dependent var	0.851852
Adjusted R-squared	0.294734	S.D. dependent var	6.606312
S.E. of regression	5.547988	Akaike info criterion	6.335935
Sum squared resid	769.5042	Schwarz criterion	6.431923
Log likelihood	-83.53512	Hannan-Quinn criter.	6.364477
F-statistic	11.86554	Durbin-Watson stat	1.386256
Prob(F-statistic)	0.002028		

OILDEP

Null Hypothesis: D(OILDEP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		5.489947	0.0001
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OILDEP,2)

Method: Least Squares
Date: 03/09/25 Time: 21:24
Sample (adjusted): 1997 2023
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OILDEP(-1))	-1.048077	0.190908	-5.489947	0.0000
C	-0.019231	0.014696	-1.308560	0.2026

R-squared	0.546605	Mean dependent var	-0.003704
Adjusted R-squared	0.528469	S.D. dependent var	0.109128
S.E. of regression	0.074936	Akaike info criterion	-2.273181
Sum squared resid	0.140385	Schwarz criterion	-2.177193
Log likelihood	32.68794	Hannan-Quinn criter.	-2.244639
F-statistic	30.13952	Durbin-Watson stat	1.852885
Prob(F-statistic)	0.000011		

INF

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		10.72220	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 03/09/25 Time: 21:24
Sample (adjusted): 1996 2023
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.734663	0.068518	-10.72220	0.0000
C	9.233869	1.317727	7.007423	0.0000

R-squared	0.815558	Mean dependent var	-1.717857
Adjusted R-squared	0.808464	S.D. dependent var	10.06612
S.E. of regression	4.405419	Akaike info criterion	5.872297
Sum squared resid	504.6007	Schwarz criterion	5.967455
Log likelihood	-80.21216	Hannan-Quinn criter.	5.901388
F-statistic	114.9656	Durbin-Watson stat	1.374039

Prob(F-statistic)	0.000000

INT

Null Hypothesis: INT has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.566388	0.0140
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INT)
Method: Least Squares
Date: 03/09/25 Time: 21:25
Sample (adjusted): 1998 2023
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT(-1)	-0.929554	0.260643	-3.566388	0.0017
D(INT(-1))	0.027554	0.182945	0.150615	0.8817
D(INT(-2))	0.281516	0.115575	2.435779	0.0234
C	4.854663	1.818808	2.669145	0.0140

R-squared	0.556756	Mean dependent var	-0.419231
Adjusted R-squared	0.496314	S.D. dependent var	7.280935
S.E. of regression	5.167343	Akaike info criterion	6.263232
Sum squared resid	587.4314	Schwarz criterion	6.456786
Log likelihood	-77.42202	Hannan-Quinn criter.	6.318969
F-statistic	9.211354	Durbin-Watson stat	1.542046
Prob(F-statistic)	0.000387		

EXC

Null Hypothesis: EXC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	3.047751	1.0000

Test critical values:	1% level	-3.689194
	5% level	-2.971853
	10% level	-2.625121

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXC)
Method: Least Squares
Date: 03/09/25 Time: 21:25
Sample (adjusted): 1996 2023
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXC(-1)	0.204257	0.067019	3.047751	0.0052
C	-12.45960	13.53916	-0.920263	0.3659

R-squared	0.263222	Mean dependent var	22.24286
Adjusted R-squared	0.234884	S.D. dependent var	44.31494
S.E. of regression	38.76267	Akaike info criterion	10.22154
Sum squared resid	39066.15	Schwarz criterion	10.31670
Log likelihood	-141.1016	Hannan-Quinn criter.	10.25063
F-statistic	9.288787	Durbin-Watson stat	1.502818
Prob(F-statistic)	0.005240		

Null Hypothesis: D(EXC,2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.305208	0.0024
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXC,3)
Method: Least Squares
Date: 03/09/25 Time: 21:26
Sample (adjusted): 1998 2023
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(EXC(-1),2)	-1.450110	0.336827	-4.305208	0.0002
C	8.840874	9.010678	0.981155	0.3363

R-squared	0.435756	Mean dependent var	7.457692
Adjusted R-squared	0.412246	S.D. dependent var	59.89219
S.E. of regression	45.91641	Akaike info criterion	10.56533
Sum squared resid	50599.60	Schwarz criterion	10.66210
Log likelihood	-135.3492	Hannan-Quinn criter.	10.59319
F-statistic	18.53482	Durbin-Watson stat	1.550267
Prob(F-statistic)	0.000243		

BOUND TEST

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	14.165682	10%	2.2	3.09
k		5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
			Finite Sample: n=35	
Actual Sample Size	28			
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
			Finite Sample: n=30	
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

LONG RUN EFFECT

ARDL Long Run Form and Bounds Test
Dependent Variable: D(GEXPE)
Selected Model: ARDL(1, 0, 0, 1, 0)
Case 2: Restricted Constant and No Trend
Date: 03/09/25 Time: 21:28
Sample: 1995 2023
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.

OILDEP	7.834284	14.24902	0.549812	0.5882
INF	0.152245	0.275115	0.553387	0.5858
EXC	0.061481	0.019808	3.103808	0.0054
INT	0.101072	0.273077	0.370124	0.7150
C	7.760800	2.87158	5.521855	0.0002

EC = GEXPE - (7.8343*OILDEP + 0.1522*INF + 0.0615*EXC + 0.1011*INT -7.7608)

SHORT RUN EFFECT

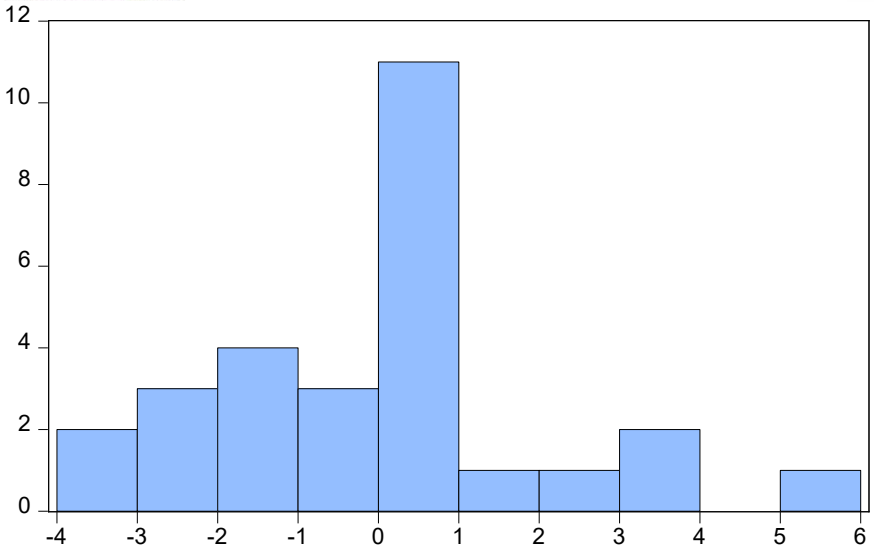
Dependent Variable: GEXPE
Method: ARDL
Date: 03/09/25 Time: 21:31
Sample (adjusted): 1996 2023
Included observations: 28 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): OILDEP INF EXC INT
Fixed regressors: C
Number of models evalulated: 16
Selected Model: ARDL(1, 0, 0, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GEXPE(-1)	0.599114	0.196118	3.054872	0.0060
OILDEP	3.140653	5.733185	0.547803	0.5896
INF	0.061033	0.103203	0.591388	0.5606
EXC	0.116034	0.013853	8.376186	0.0000
EXC(-1)	-0.091387	0.017547	-5.208086	0.0000
INT	0.040518	0.100994	0.401195	0.6923
C	3.111195	5.746437	-0.541413	0.5939

R-squared	0.960520	Mean dependent var	14.21071
Adjusted R-squared	0.949240	S.D. dependent var	10.49237
S.E. of regression	2.363930	Akaike info criterion	4.770846
Sum squared resid	117.3515	Schwarz criterion	5.103897
Log likelihood	-59.79184	Hannan-Quinn criter.	4.872663
F-statistic	85.15244	Durbin-Watson stat	2.160895
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

NORMALITY TEST



Series: Residuals	
Sample 1996 2023	
Observations 28	
Mean	7.40e-15
Median	0.197526
Maximum	5.926135
Minimum	-3.818964
Std. Dev.	2.084790
Skewness	0.644988
Kurtosis	3.871335
Jarque-Bera	2.827140
Probability	0.243273

BREUSCH GODFREY SERIAL CORRELATTION LM TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.742281	Prob. F(2,19)	0.4893
Obs*R-squared	2.029223	Prob. Chi-Square(2)	0.3625

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 03/09/25 Time: 21:32
Sample: 1996 2023
Included observations: 28
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GEXPE(-1)	-0.057833	0.347729	-0.166316	0.8697
OILDEP	-2.100112	6.128988	-0.342652	0.7356
INF	-0.054809	0.115434	-0.474811	0.6403
EXC	-0.001357	0.014700	-0.092348	0.9274
EXC(-1)	0.003943	0.029874	0.131984	0.8964
INT	-0.060892	0.113855	-0.534823	0.5990
C	2.835551	6.299897	0.450095	0.6577
RESID(-1)	-0.049243	0.423315	-0.116327	0.9086
RESID(-2)	0.328203	0.318325	1.031034	0.3155

R-squared	0.072472	Mean dependent var	7.40E-15
Adjusted R-squared	-0.318066	S.D. dependent var	2.084790
S.E. of regression	2.393486	Akaike info criterion	4.838471
Sum squared resid	108.8467	Schwarz criterion	5.266679
Log likelihood	-58.73859	Hannan-Quinn criter.	4.969378
F-statistic	0.185570	Durbin-Watson stat	2.058181

Prob(F-statistic)	0.990028

HETEROSKEDASTICITY TEST

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.023950	Prob. F(6,21)	0.4372
Obs*R-squared	6.337513	Prob. Chi-Square(6)	0.3865
Scaled explained SS	5.117941	Prob. Chi-Square(6)	0.5288

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 03/09/25 Time: 21:33
Sample: 1996 2023
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	24.27124	17.53400	1.384239	0.1808
GEXPE(-1)	-0.607242	0.598410	-1.014758	0.3218
OILDEP	-11.41965	17.49356	-0.652792	0.5210
INF	-0.441457	0.314901	-1.401891	0.1756
EXC	0.076936	0.042269	1.820163	0.0830
EXC(-1)	-0.071514	0.053541	-1.335682	0.1960
INT	-0.294779	0.308162	-0.956570	0.3497

R-squared	0.226340	Mean dependent var	4.191124
Adjusted R-squared	0.005294	S.D. dependent var	7.232186
S.E. of regression	7.213017	Akaike info criterion	7.001970
Sum squared resid	1092.580	Schwarz criterion	7.335021
Log likelihood	-91.02757	Hannan-Quinn criter.	7.103787
F-statistic	1.023950	Durbin-Watson stat	2.077073
Prob(F-statistic)	0.437172		

An appraisal of |Artificial Intelligence: A means of Improving Accounting Profession in Nigerian Banking Industry

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Abstract

Artificial Intelligence is changing the reality of the accounting field, at a rapid way, due to the benefit of enhancing and transforming the current approach of performing activities in this domain. Over the years accounting has changed significantly by transforming from paper-and-pencil work to computer, but more importantly with programmes able to decrease time spent on repetitive work which minimize errors. This study, therefore investigated the effect of artificial intelligence on the accounting profession in the Nigerian banking industry. Specifically, this study examined the effect of artificial intelligence on the transparent reporting by accounting professionals, the accurate reporting of accounting professionals and accounting professionals' data analytics in the Nigerian banking industry. Quantitative research was conducted using data from three selected commercial banks: United Bank for Africa (UBA), Guaranty Trust Bank Plc (GT Bank) and Access Bank Plc. The data gathered from these banks were analysed through simple regression analysis in SPSS version 28. The findings revealed that artificial intelligence has a significant positive impact on transparent reporting by accounting professionals (R-Square = 0.720, F statistic = 10.61); artificial intelligence has a significant positive impact on the accurate reporting of accounting professionals (R-Square = 0.78, F-statistic = 0.637); and artificial intelligence significantly impacts accounting professionals' data analytics (R-Square = 0.824, F-statistic = 1.926). This study concluded that the artificial intelligence has significantly influenced accounting profession in the Nigerian banking sector. Based on the findings, it is recommended that organizations should invest in proper infrastructure, data quality management, and employee training to successfully implement AI in accounting and financial reporting. Also, it is essential that accountants and auditors in the banking industry are encouraged to integrate AI applications in shaping future strategies for accounting and auditing

***Keywords**: Accounting Profession, Data Analytics, Artificial Intelligence, Transparent and Accurate reporting*

1.1 INTRODUCTION

Accounting is only one of the many professions that have seen significant change in recent years due to the integration of Artificial Intelligence (AI) (Gonçalves et al., 2022). Traditional accounting procedures have been completely transformed by AI-driven technologies, which have also changed the workforce and provided previously unheard-of efficiency improvements. The thesis statement that AI-driven automation in accounting offers workforce implications and efficiency improvements is presented in this introduction, which also gives a summary of how AI is being integrated into accounting and how it is being used to automate typical accounting operations.

By utilising cutting-edge technologies to improve accuracy, efficiency, and strategic insights, the incorporation of AI in accounting represents a substantial paradigm shift in the field (Odonkor et al., 2024). The term artificial intelligence (AI) refers to a variety of technologies that allow computers to carry out tasks that have historically required human intelligence, such as robotic process automation, machine learning, and natural language processing (Soori et al., 2023). AI-driven technologies in accounting enable businesses to make better decisions and maximise financial performance by automating repetitive operations, streamlining workflows, and offering real-time insights into financial data. Financial reporting, auditing, tax compliance, and risk management are just a few of the accounting-related areas that artificial intelligence is transforming.

Organisations may produce more accurate financial reports, spot possible risks, and guarantee regulatory compliance by using AI-powered algorithms to analyse enormous volumes of financial data, find patterns, and spot abnormalities (Soviany, 2019; Aitkazinov, 2023). Additionally, accountants may devote more of their time to value-added activities like data analysis, strategic planning, and decision-making since AI-driven solutions automate monotonous operations like data entry, reconciliation, and financial analysis (Ajayi-Nifise et al., 2024). Automating repetitive, time-consuming, and human error-prone regular jobs is one of AI's main applications in accounting. Data entry, reconciliation, and financial reporting are examples of routine accounting processes that frequently involve a large amount of human labour and can cause a bottleneck in accounting workflows (Tucker, 2017). By using sophisticated algorithms to process massive amounts of data, spot trends, and carry out computations quickly and precisely, AI-driven automation simplifies these chores. Applications for AI-driven automation in accounting are numerous and include.

AI systems remove the need for human data entry by extracting pertinent information from documents like bank statements, invoices, and receipts (Pandey et al., 2023). Compared to

manual techniques, AI-powered reconciliation technologies are more efficient in matching financial transactions, identifying discrepancies, and reconciling accounts. The time and effort needed for human report generation is decreased by AI-driven software, which creates financial reports, statements, and analyses according to preset templates and rules (Sunkle et al., 2022).

By speeding up repetitive activities, increasing accuracy, and allowing businesses to optimise financial processes, the incorporation of AI-driven automation in accounting delivers efficiency improvements (Peng et al., 2023). But it also has consequences for the workforce, such as worries about job displacement and how the function of accountants will change. This research will examine the workforce implications and efficiency improvements of AI-driven automation in accounting, emphasizing how AI is revolutionizing traditional accounting methods and how accountants' roles are changing in the digital era.

In tandem with this significant shift to a digital world, accountants and auditors demand intelligent tools that enable them to complete duties efficiently and precisely. As a result, artificial intelligence (AI) applications were implemented in this field. Traditional accounting techniques are unable to effectively analyse and analyse such enormous volumes of data as businesses struggle with the growing volume and complexity of economic data (Sreseli, 2023). By using cutting-edge algorithms and machine learning approaches, artificial intelligence (AI) presents a viable solution that can automate and streamline accounting procedures, improve data analysis skills, and increase the timeliness and accuracy of financial reporting (Eziefule et al., 2024). The advantages, difficulties, and moral issues of incorporating AI into these vital economic processes are examined in this article.

1.2 Research Objectives

Thus, the main objective of this study is to investigate the effect of artificial intelligence and accounting profession in Nigeria with reference to the three selected commercial banks in Nigeria. The specific objectives of the study are:

i. To identify the extent to which artificial intelligence efficiently improve the transparent reporting of accounting professional.
ii. To examine the extent to which artificial intelligence conductively promote accurate reporting of accounting professional.
iii. To ascertain how the intelligence influence accounting professional’s data analytics.

1.3 Research Questions

i. What is the extent that artificial intelligence can efficiently improve the transparent reporting of accounting professional?

ii. What is the extent that artificial intelligence can conductively promote accurate reporting of accounting professional?

iii. How can the artificial intelligence influence accounting professional's data analytics?

1.3 Research Hypotheses

The following research null hypotheses are formulated based on the above generated research questions.

H_o1: Artificial intelligence cannot have a significant impact on the transparent reporting of accounting professional.

H_02: Artificial intelligence has no significant impact on the accurate reporting of accounting professionals.

H_03: Artificial intelligence does not significantly impact accounting professional's data analytics.

LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Concept of Artificial Intelligence

The experimental component of computer science involves creating an intelligent machine that can perform a variety of tasks by utilising its intelligence. Artificial intelligence refers to systems that are programmed to think and act similarly to human intelligence, which performs tasks more effectively than humans (Dongre, Pandey, & Gupta, 2020). Similarly, Ezeribe (2019) defined artificial intelligence as a technique for imparting human-like intelligence to a computer, computer-controlled robot, or software. According to Odoh et al. (2018), artificial intelligence can also be defined as a program that possesses the software capability to perform tasks that are typically performed only by the human brain. These activities encompass both the ability to learn and the capacity for knowing. It also comprises the ability to judge, understand relationships and produce original thoughts. Artificial intelligence solutions are represented by deep learning and decision making, machine reading and vision and natural language processing and generation (Clarence et. al., 2019). In another perspective, Artificial intelligence is the ability of a computer system to be able to observe and learn from its experiences and simulate human intelligence in decision-making (Ezeribe, 2019).

One of Artificial Intelligence subfield is represented by machine learning. This represents the ability of computers to program themselves, taking their own decisions and predictions, using the data they find. An everyday accounting activity is represented by reconciliation procedures, which needs for the moment, the intervention of a human in order to be performed. This task can be completed automatically with machine learning since machines can make simple logical connections. In this manner, the accountant can use the time spent on this task to concentrate more on their consulting work, utilising machine learning to enhance their offerings (Duffy, 2018).

2.1.2 Accounting Profession

Simply said, the accounting profession is thought of as one that is in charge of gathering, categorising, and documenting information, as well as summarising, evaluating, and interpreting it for users of financial statements (Kwarbai and Omojoye, 2021). Accounting profession delivers qualitative financial information about economic entities that is meant to be beneficial in economic decisions. When conducting business and economic activities, this information enables users to make well-reasoned decisions among various uses of limited resources.

Professional Accountants are those who trained as accountants and also acquired an additional training from the authorised professional accounting bodies. They receive recognition and licenses to provide public accounting and financial services from these professional accounting bodies. They are regularly observed and overseen by the accounting agencies to guarantee rigorous adherence to ethical considerations and best practice guidelines. Language, computer, interpersonal, leadership, analytical, multi-tasking, due diligence, and training skills are among the abilities needed by an accountant, according to Ronny and Yuanyuan (2013). The same light, numerous talents required by accounting profession include are accounting, auditing, taxes, accounting software, business law, human resource management, retail/consignment business, operation & supply chain, project management, and strategic management. The process of accounting, according to Ronny & Yuanyuan (2013), is the creation of financial reports, beginning with papers and ending with financial statements. He listed the three components of the accounting process—process design, preparation, and handling.

2.1.3 Accounting profession activity evolution

The financial sector has seen significant growth in recent years, and one of the industry's main priorities seems to be the development of financial instruments and procedures that will raise

the likelihood of more accurate outcomes in banking, investment, and insurance products (Mirzaey et al., 2018).

Following the financial crisis in 2008, there was a need for businesses to concentrate more on global financial health. Risk management and cost control were the first two areas that needed improvement. In order to support this transition, accounting departments started to concentrate on producing better results, within the approved budget (Smith, 2018).

According to UiPath, (2020), the ability of finance professionals to advise business executives on technical and commercial matters of the company has led to a rise in their presence at the top echelons of the organization's strategic decision-making process.

In order to ensure improved client connections, the finance and accounting sectors began utilising new technologies. However, this should come at the expense of producing more accurate findings, which are essential for decision-making, risk analysis, controlling, and reporting. The way a service is created, monitored and supplied to the client has changed dramatically, due to the new regulatory regime imposed for financial services (Andrianopoulos et.al., 2019).

2.1.4 Major Technologies of Artificial Intelligence Expert Systems

A software programming system that facilitates the development of expert or knowledge-based systems is known as an expert system shell. The implementation of this system is simple. Expert systems are the most extensively utilised artificial intelligence technology. Adopted in the 1980s, this artificial intelligence program was designed to reach a level of proficiency that could displace human dominance in a certain area of decision-making. Expert system shells are frequently used in their development. Hence, this means any area in which a person/group has exceptional qualities needed by others. This is a prospective field for an expert system.

Neural Networks

Electronic models of the neural architecture of the human brain are the focus of this area of artificial intelligence (Taghizadeh, Mohammad, Dariush, and Jafar, 2013). Neural networks provide computer programs the capacity to learn, and they enable any machine to mimic the structure of the human brain through structural simulation (Shukla and Jaiswal, 2013). This was in line with the findings of other artificial intelligence researchers that neural network is one of the chief aspects of artificial intelligence and it is of great interest because it mainly enables any machine to execute the functions of the human brain (Greenman, 2017: Taghizadeh et al., 2013: Kuma, and Thakur, 2012).

Robots

The science and technology underlying the design, manufacture, and use of robots is the focus of this area of artificial intelligence technology (Graetz and Michaels, 2015). In 1979, the Robot Institute of America defined a robot as a multifunctional manipulator that can move parts, materials, tools, or specialised devices through a number of preprogrammed and reprogrammable motions to perform a variety of tasks. Robots are constructed and equipped with the ability to sense their environment in a manner similar to how humans sense their surroundings; they can sense their surroundings, power themselves, and move around using sensors, such as pressure (hands), light (eyes), sonar and hearing (ears), chemical (nose), and task (tongue), which gives the impression that they are intelligent.

Fuzzy Logic

One area of artificial intelligence that works with a human-like thinking process is fuzzy logic. Fuzzy logic mimics human decision-making processes. It frequently involves partial truth which ranges between fully false and completely true (Taghizadeh et al., 2013). According to Taghizadeh et al. (2013), fuzzy logic is founded on fuzzy set theory, which is a generalisation of classical set theory and asserts that "an element either is or is not a member of the set." Fuzzy logic has many practical and business applications in artificial intelligence. It can control machines even though its reasoning may not be accurate, it gives acceptable.

2.1.5 Artificial Intelligence in Accounting.

The main goal of accounting is to give users the information they need to make economic decisions, whether they are internal or external, in the most suitable and customised way possible. Every relevant region of the modern world has embraced and adjusted to the use of information and communication technologies. Many accounting professions are included in this evolutionary process, and the accounting profession is a vast industry that includes auditing, taxation, management, forensics, and corporate reporting (Otekunrin et al., 2022). Because it promotes students to acquire knowledge and literacy in the many applications and information of accounting, technology in accounting has become significant in the educational sector.

An innovative advancement, artificial intelligence has the potential to transform the accounting industry by enabling more efficient delivery and strategic decision-making than previously possible. Applications of artificial intelligence (AI) in accounting date back more than 25 years. Greenman (2017) Machine learning models, an advance in AI, when applied to data or other developments of AI can complement human thinking, be used to prevent fraud, human mistake

and promote accurate performance of accounting functions (Shivani. G, 2020). The accounting profession greatly benefits from it (Otekunrin et al., 2018; Otekunrin et al., 2019).

Emerging technologies help businesses grow by allowing them to access new markets more quickly, contribute significantly globally, learn more, and cultivate relationships with both current and potential customers. The operations of the AI will be of pivotal change to accounting practice. Accounting administrators will no longer have to perform tedious and labour-intensive tasks in domestic accounting; the system will assist in resolving issues that human input may have missed or failed to identify. Automating, digitising, and using artificial intelligence to process and sort various types of data would save money compared to doing these processes by hand while increasing productivity. It develops the capacity to use the information and resources at hand to work effectively. The gap between the areas of accounting and computer science in the areas of artificial intelligence can be closed by accounting practitioners and researchers, as they bring both fields in conjunction to improve business productivity (Baldwin, Brown & Trinkle, 2006; Otekunrin et al., 2019; Otekunrin et al., 2018; Otekunrin et al., 2017)

2.2 Theoretical Review

The theoretical foundation of this study is agency theory, which originated in economic theory and was expanded upon by Jensen and Meckling (1976). According to the theory, the principal (owners and shareholders) gives the agent (directors, managers, and management) the authority to make decisions, and the agent may pursue interests that are not always in the principal's best interests but could actually harm the principal due to information asymmetry (Ogoun, 2020).The agency theory deals with entrusting products to the agent who in turn is required to produce a statement in qualitative and quantitative way and are expected to be in alignment with the interest of the owners of a business and managers of a business and managers in order for the set objectives of the organization to be achieved.

In the 1960s and 1970s, the basic agency paradigm was developed in the economics literature to determine the optimal value of risk-sharing among various individuals (Jensen & Meckling, 1976). Gradually, however, the agency theory domain was expanded to the management area to determine cooperation between various individuals with different objectives in the firm and goal congruency attainment (Kwafo, 2019). In the 1980s, agency theory also appeared extensively in the auditing and accounting realms to determine the optimal-incentive contracting among various individuals and the establishment of appropriate accounting control mechanisms for monitoring their behaviours and actions (Gotthardt, et al., 2020). This final function of the agency theory will be highlighted in this study. In its primitive form, agency

theory relates to situations in which one individual (called the agent) is engaged by another person (called the principal) to perform on his/her behalf based upon a designated compensation schedule. Since both persons are assumed to

be utility maximizer, and motivated by pecuniary and non-pecuniary items, incentive problems may come up, particularly under the condition of uncertainty and informational asymmetry (Longinus, 2018). Since the agency theory focuses on solving conflict between principal and agents that may have different objectives, it underpins this study as it addresses the functional roles played artificial intelligence (AI) in accounting within a banking sector. This theory emphasises how AI lessens problems encounter by traditional agency by improving transparency and control. It is also appeared that there would be new levels of agency risks when AI assumes decision making authority.

2.3 Empirical Review

This section is focused on the empirical evidence from the existing literature in area of the implementation of artificial intelligence in accounting profession.

In their article for the Harvard Business Review, Davenport & Ronanki (2018) argue that businesses should consider AI's business capabilities rather than its technical prowess. Generally speaking, AI may assist companies in achieving three main goals: automating corporate procedures, gaining knowledge through data analysis, and establishing connections with customers and employees. Chukwuani & Egiyi (2020) evaluated the impact of artificial intelligence on the accounting business. By doing this, they demonstrated the degree of progress being made in the accounting sector with regard to the automation of the accounting process. Lastly, they described the role of accountants in contemporary automation and how 21st-century accountants may adjust to the industry's pervasive automation. O'Leary (1995) carried out a study in the 1990s that illustrated the kinds of research being done on AI in accounting, finance, and management in the then-current environment. He discovered that, according to research published in the International Journal of Intelligent Systems in Accounting, Finance, and Management (IJISAFM), the percentage of studies on the application of AI in accounting, finance, and management was 29.63%, 28.40%, and 20.99%, respectively. The subjects that were mostly investigated there were case-based learning, machine learning, neural networks, knowledge-based system applications, multiple agents, constraint logic programming, etc. Huang (2018) investigated the use of AI in taxation. The author provided evidence of actual AI taxation applications in China to support their argument. Chukwudi et al. (2018) described the effects of AI on accounting functions using a survey-based descriptive

study. According to this study, the use of artificial intelligence improved the way accounting firms in South East Nigeria performed their accounting functions.

The usage of AI is not limited to large organisations, according to Lee & Tajudeen's (2020) study on Malaysian firms adopting various AI-based accounting software. They also saw that businesses were storing invoice photos and automating the entire information gathering process with AI-based accounting software. The difficulties and future directions of AI and big data in education research, policy-making, and business were discussed by Luan et al. (2020). These consist of industry, policy, and education related to accounting and auditing. They contend that in order to fully realise the potential of the AI and big data advancements, professionals from a range of disciplines, academia, and policymakers must work together effectively in response to the innovations and challenges presented by these revolutions. They also noted that the industrial, policy-making, and research communities share a number of overlapping areas of interest. These shared interests necessitate collaborative approach but the primary hurdle to that is the lack of vision on the part of these groups and also lack of requisite knowledge and abilities. In their analysis, Baldwin et al. (2006) noted that the advent of numerous regulations in the early 2000s, coupled with well-publicized audit failures, led to an increasingly complicated audit environment. The audit profession was under tremendous pressure to provide high-quality audit and assurance services. In that regard the authors welcomed and promoted interdisciplinary collaboration between Accounting and AI professionals that would result in a cornucopia of fruitful research and development instead of simply theoretical and prototype development works largely found in the existing literature. Through a review of pertinent literature, the study's authors demonstrated that several attempts had been made to create AI-based systems to assist with assurance and auditing tasks. Kokina & Davenport (2017) divided the types of AI applications into four groups, and the level of intelligence attained so far in the technology into another four groups. The applications include analysing numbers, digesting words and images, performing digital tasks, and performing physical tasks. The categories for the levels of intelligence are: human support, repetitive task automation, context awareness & learning, and self-aware intelligence. While none of the AI applications have yet attained the self-aware intelligence level, many accounting and auditing tasks can be completed using the other three levels of intelligence.

Makridakis (2017) investigated the extant and forthcoming AI advancements and the capability of machines to attain real intelligence. The study highlighted major views and scenarios of how AI may revolutionize human life. Among the various ways that AI may transform human milieu,

the metamorphosis of the discipline and profession of accounting & auditing is a very important one.

2.4 Gaps in Literature

Many studies have investigated the impact of artificial intelligence on accounting system, accounting profession, accounting and auditing quality (Davenport & Ronanki, 2018); Chukwuani & Egiyi, 2020; Huang, 2018; Lee & Tajudeen, 2020; Kokina & Davenport, 2017; Makridakis, 2017). Having critically reviewed many studies in this study area, it is observed that no study has been specifically investigated the impact of artificial intelligence on transparent reporting of accounting professional, accurate reporting of accounting professionals, and accounting professional's data analytics. In other to fill this gap, this study is carried out to specifically examine the impact of artificial intelligent on accounting profession measured by transparent reporting of accounting professional, accurate reporting of accounting professionals, and accounting professional's data analytics.

3.0 METHODOLOGY

The study used the survey research design to obtain information on the implementation of Artificial Intelligence on Accounting Profession in Nigerian Banking Industry. The quantitative method was employed. A well-structured closed-ended questionnaire was used to gather quantitative data from the participants who are the staff of the three selected commercial banks: United Bank for Africa (UBA), Guaranty Trust Bank Plc (GT Bank) and Access Bank Plc. These banks were randomly selected within Ibadan metropolis with target population of 200 employees who are the banks' accountants and their internal auditors.

Stratified sampling technique was used to select the participants (the banks' accountants and their internal auditors). The questionnaire survey was designed in such a way that the participants were asked to determine the degree of importance of each information using Likert-type four scales, where (1) referred to strongly disagree, (2) Disagree, (3) Agree, and (4) strongly agree. Online survey was utilised to gather quantitative data from participants. The google form questionnaire were prepared and sent into the participants' email through the banks' HR managers, and 120 responses were finally received. The quantitative data gathered were analysed through simple regression analysis in Statistical Packages for Social Science (SPSS) version 28.

Model specification

Simple regression analysis was employed to investigate the impact of Artificial intelligence (AI) on accounting profession measured by transparent reporting of accounting professional, accurate reporting of accounting professionals, and accounting professional's data analytics.

X = f (Y)……eqt 1

X = Artificial Intelligence (AI)

Y = Accounting Profession

Y = (y_1, y_2 and y_3)

y_1, = Transparent reporting of accounting professional

y_2, = Accurate reporting of accounting professionals

y_3 = Accounting professional's data analytics

y_1, = f (X)……..Eqt. (1)

y_1, = a_0 + a_1 (X)……Model (1)

Where: a_0=Constant, and a_1 =regression coefficient

y_2, = f (X)……..eqt. (2)

y_2, = b_0 + b_1 (X)……Model (2)

Where: b_0=Constant, and b_1 =regression coefficient

y_3, = f (X)……..Eqt. (3)

y_3, = c_0 + c_1(X)……..Model.(3)

Where: c_0=Constant, and c_1 =regression coefficient

4.0 DATA ANALYSIS AND INTERPRETATION

This section focused on the data analysis and interpretation of the results obtained from SPSS data analytical tool. Basically, the formulated null research hypotheses were analysed using simple regression.

4.1 Test of Hypotheses

Hypothesis one

$H_0$1: Artificial intelligence cannot have a significant impact on the transparent reporting of accounting professional.

Table: Artificial intelligence and Transparent reporting of accounting professional

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.251	2.132		1.901	.020

	Artificial Intelligence (AI)	2.910	1.039	2.912	23.356	.000
a. Dependent Variable: Transparent reporting of accounting professional (TRAP)						
R-Square = 0.720 F-statistics = 10.61 at p-value of 0.000						

Source: SPSS version 28

In the table 1 above, the constant value 1.251 indicates that the transparent reporting of accounting professional (TRAP) is 1.251 holding all the independent variable (artificial intelligence) constants. Basically, the regression coefficient of artificial intelligence (AI) (2.910) indicates that a unit change in AI leads to 2.910 positive change in TRAP.

The coefficient of determination (R-Square = 0.720) indicates that 72% variations in Transparent reporting of accounting professional (TRAP) can be explained by implementation of artificial intelligence (AI) in the financial institutions' accounting system. Hence, 28% of variation in the dependent variable (TRAP) could be explained only by other factors that were not included in the model.

The F-statistic (10.61) at P-value of 0.000 reveals that the overall model was statistically significant and the independent variable (artificial intelligence) is good predictor of transparent reporting of accounting professional (TRAP) in the financial institutions. This implies that the TRAP is strongly enhanced by AI as p-value 0.000 is less than significant level 0.05.

Considering the result from the findings, the study's research null hypothesis one should be rejected. Therefore, it is concluded that artificial intelligence has a significant impact on the transparent reporting of accounting professional in the financial institutions.

Hypothesis two

$H_0$2: Artificial intelligence has no significant impact on the accurate reporting of accounting professionals.

Table 2: Artificial intelligence and accurate reporting of accounting professionals

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.153	2.117		1.311	.013
	Artificial Intelligence (AI)	2.931	1.034	1.932	27.024	.000
a. Dependent Variable: Accurate reporting of accounting professionals (ARAP)						

R-Square = 0.781
F-statistics = 0.637 at p-value of 0.000

Source: SPSS version 28

The constant value (1.153) in the table 2 above reveals that the Accurate reporting of accounting professionals (ARAP) is 1.153 holding all the independent variable (artificial intelligence) constants. The artificial intelligence (AI) with coefficient (2.931) indicates that a unit change in AI leads to 2.931 positive change in ARAP

The value of coefficient of determination (R-Square) which is 0.781 indicates that 78% variations in Accurate reporting of accounting professionals (ARAP) can be explained by implementation of artificial intelligence (AI) in the financial institutions' accounting system. Hence, 22% of variation in the dependent variable (ARAP) could be explained only by other factors that were not included in the model.

The F-statistic (0.637) at P-value of 0.000 shows that the overall model was statistically significant and the independent variable (artificial intelligence) is good predictor of Accurate reporting of accounting professionals (ARAP) in the financial institutions. This implies that the ARAP is strongly enhanced by AI as p-value 0.000 is less than significant level 0.05.

Based on the findings, the research null hypothesis two should be rejected and it should be therefore concluded that artificial intelligence has a significant impact on the accurate reporting of accounting professionals in the financial institutions.

Hypothesis Three

$H_0$3: Artificial intelligence does not significantly impact accounting professional's data analytics.

Table 3: Artificial intelligence and Accounting professional's data analytics

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.289	1.107		2.705	.008
	Artificial Intelligence (AI)	3.887	2.031	1.937	28.183	.000
a. Dependent Variable: Accounting professional's data analytics (APDA)						

R-Square = 0.824
F-statistics = 1.926 at p-value of 0.000

Source: SPSS version 28

In the table 3, the constant value (1.289) shows that Accounting professional's data analytics (APDA) is 1.289 holding the independent variable (artificial intelligence) constants. The artificial intelligence's regression coefficient (3.887) indicates that a unit change in AI brings about 3.887 positive change in APDA.

The value of coefficient of determination (R-Square) which is 0.824 indicates that 82% variations in Accounting professional's data analytics (APDA) can be explained by implementation of artificial intelligence (AI) in the financial institutions' accounting system. Hence, 18% of variation in the dependent variable (APDA) could be explained only by other factors that were not included in the model.

The F-statistic (0.1926) at P-value of 0.000 shows that the overall model was statistically significant and the independent variable (artificial intelligence) is good predictor of Accounting professional's data analytics (APDA) in the financial institutions. This implies that the APDA is strongly enhanced by AI as p-value 0.000 is less than significant level 0.05.

With regards to the above findings, the research null hypothesis three should be rejected and it should be concluded that artificial intelligence has significantly influenced accounting professional's data analytics in the financial institutions.

4.2 Discussion of Findings

This finding is consistent with the work of Jooman (2019), who examined the impact of artificial intelligence on the future of the internal auditing profession in South Africa and found that the current influence of AI on the internal auditing profession within the SA context is still in its infancy and that internal auditors do not yet understand and appreciate the capabilities of AI. The results of hypothesis one show that approximately 72% of shifts in Transparent Reporting are caused by financial artificial intelligence. Artificial intelligence has a significant impact on Transparent Reporting as regards to the Accounting Profession in Nigeria. The Impact of Artificial Intelligence (AI) on Digital was also examined by Mhlanga (2020), who found that AI has a significant impact on digital financial inclusion in areas such as fraud detection and cyber security, addressing the issue of information asymmetry, providing customer support and helpdesk through catboats, and risk detection, measurement, and management. The results ran counter to findings of Ozili (2018). In addition, the findings of Model three, as predicted, have revealed that Automation Tagging, Anomalous Detection and Predictive forecasting solution have favourable substantial effects on Data Analytics.

Model two demonstrated that artificial intelligence significantly improves reporting accuracy based on hypothesis two. aside from artificial intelligence. Additionally, it accounts for roughly

78% of the variations in reporting accuracy brought on by AI. When it comes to Nigerian banks that employ accountants, artificial intelligence significantly affects reporting accuracy. The finding is in line with the work of Ukpong, Udoh and Essien (2019), which explored the Opportunities, Issues and Applications of Artificial Intelligence in Accounting and Auditing in Nigeria and indicated that AI integration will promote changes in the auditing process. In a similar vein, research by Odoh, Silas, Ugwuanyi, and Chukwuani (2018) found a high positive correlation between intelligent agents and accounting function performance.

The results of the third hypothesis showed that artificial intelligence was responsible for roughly 82% of changes in data analytics. Data analytics in relation to the Nigerian accounting profession is significantly impacted by artificial intelligence. The study by Ogoun (2020) did a reviewed on Expanding the Frontiers of Accounting Knowledge on Imperative for Practitioners Accommodation. It was discovered that a complete expansion of the accounting knowledge base cannot be achieved as long as practitioners prevent the deployment of new knowledge. Compared to other academic fields and professional practice, accounting would continue to lead the way in the discovery of new information. Additionally, it was noted by Duong and Fledsberg (2019) that accountants have a limited awareness of digitalisation, are still in the early stages of the process, and see the value of technical abilities in gaining entry into new roles. The results also showed that additional attributes like being an IT specialist, gregarious, and open-minded are expected of the accountant. According to Dongre, Pandey, and Gupta (2020), using AI apps would increase the value of an accountant's work rather than limiting it to basic accounting tasks. The application of AI in accounting improves decision-making and analytical skills.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The purpose of this study is to determine how the use of artificial intelligence applications affects the accounting industry in Nigerian financial institutions. Since incorporating AI into accounting and auditing could result in some significant changes to the field, this is a crucial issue for practitioners. Even though AI may automate a number of processes, accountants and other finance professionals are still crucial in analysing the outputs, confirming the findings, and formulating strategic decisions based on the insights that AI systems provide. AI with human cooperation can result in better informed and efficient decision-making. To successfully integrate AI in accounting and financial reporting, organisations must make investments in appropriate infrastructure, data quality control, and staff training. This will guarantee that AI

systems are capable of producing accurate and dependable results, are suitably calibrated, and are in line with organisational goals. Furthermore, continuous assessment and monitoring of AI systems are required to spot and fix any potential biases or mistakes. In summary, the findings of all the investigation showed that, with regard to the Nigerian accounting profession, artificial intelligence significantly improves reporting accuracy, anomalous detection, and data analytics. On the basis of relevance level, however, it can be said that AI is important for a better system in the accounting industry

5.2 Recommendations

Based on the findings of the study, the researchers recommend the following:

i. In order to raise awareness and perception among members and prepare accountants and auditors to incorporate this technology into their work, financial institutions should hold workshops and training sessions to give members insight into AI systems and how to use them.

ii. The need to provide guidelines and instructions for accountants and auditors to use AI systems efficiently in order to stay up to date with advancements in the field generally and within the accounting profession specifically.

iii. In order to prepare future visions and strategies pertaining to the accounting and auditing profession, it is imperative that accountants and auditors be encouraged to employ AI technologies.

iv. Artificial intelligence should be included into financial organisations' sampling systems. If an audit is necessary, it will be feasible to examine all of the data rather than just a sample, but without the substantial resources usually needed for what is usually referred to as a full audit.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON ACCOUNTING EDUCATION

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) has significantly transformed the accounting profession, necessitating a shift in accounting education to equip graduates with relevant skills for an AI-driven environment. This study examines the integration of AI-related courses and skills into accounting curricula using Nigeria as a case study. Employing a mixed-methods research design, combining quantitative and qualitative approaches, data was collected from 200 respondents, including students, educators, and professionals. Descriptive statistics revealed that AI learning tools and resources are moderately available, but AI-related content in courses remains insufficient. Correlation analysis indicated weak associations between AI integration and institutional support, faculty expertise, and industry collaboration, highlighting the need for stronger partnerships. The study aligns with the Technology Acceptance Model and Constructivist Learning Theory, emphasizing the importance of technological readiness and experiential learning. Findings suggest that while AI courses are increasingly present, students' preparedness for AI-driven accounting remains suboptimal. Challenges include inadequate faculty expertise, limited hands-on AI training, and institutional constraints. The study recommends curriculum reforms, increased faculty training, enhanced industry-academia collaboration, and policy interventions to promote AI integration. Strengthening AI education in accounting will enhance graduates' adaptability, ensuring they remain competitive in the evolving digital landscape.
Keywords: Accounting Education, Artificial Intelligence, Curriculum Development, Skill Set, Technology Integration.

INTRODUCTION

Accounting education has continually evolved in response to technological advancements, regulatory changes, and industry demands. The emergence of Artificial Intelligence (AI) is one of the most significant transformations affecting the accounting profession, necessitating a shift in how accountants are trained and educated. AI-driven tools such as robotic process

automation (RPA), machine learning, and natural language processing (NLP) have revolutionized traditional accounting tasks, automating processes like bookkeeping, financial reporting, auditing, risk assessment, and fraud detection (Moffitt, Rozario, & Vasarhelyi, 2018). As AI increasingly influences the accounting profession, educational institutions must ensure that accounting graduates possess the necessary skills to thrive in an AI-driven environment (Brynjolfsson & McAfee, 2017). Traditionally, accounting education has focused on manual bookkeeping, financial statement preparation, tax computations, and auditing techniques. However, the automation of these tasks has shifted the role of accountants from mere data processing to strategic decision-making, requiring analytical, problem-solving, and technological skills (Richins et al., 2017). Despite these changes, many universities and professional accounting bodies continue to emphasize traditional curricula, leaving graduates ill-equipped to navigate AI-enhanced financial environments (Warren, Moffitt, & Byrnes, 2015). The limited integration of AI-related courses in accounting programs is a growing concern, as students graduate without practical exposure to AI applications in the field. Another critical issue is the lack of faculty expertise in AI-related subjects. Many accounting educators have not been trained in AI applications and, as a result, struggle to incorporate AI concepts into their teaching (Mikalef & Gupta, 2021). Without well-equipped educators, the adoption of AI in accounting curricula remains limited, further widening the gap between accounting education and industry demands. Additionally, industry collaboration on AI skills training remains inadequate. Many graduates enter the workforce without hands-on experience in using AI-driven accounting tools, predictive analytics, and automated auditing systems, reducing their employability in the modern financial sector (Davenport & Ronanki, 2018). Beyond technical skills, the adoption of AI in accounting also presents ethical and regulatory challenges that are often overlooked in accounting education. AI-driven decision-making processes can introduce biases, inaccuracies, and ethical dilemmas, making it essential for accounting professionals to understand AI governance and compliance (Brougham & Haar, 2018). However, most accounting programs do not provide structured training on AI ethics, leaving graduates unprepared to address transparency, accountability, and regulatory risks in AI-powered financial reporting and auditing (Russell & Norvig, 2020). Furthermore, the effectiveness of AI-driven accounting education depends on the pedagogical approaches adopted by educators. Traditional lecture-based teaching methods may not be sufficient in preparing students for AI-integrated accounting roles. Instead, experiential learning techniques such as case studies, simulations, and hands-on AI projects are necessary to develop students' problem-solving and

critical-thinking abilities (Kolb, 2014). Research suggests that interactive learning experiences are more effective in equipping students with adaptability skills required in an AI-driven accounting profession (Hendry, 2021).

Despite the numerous benefits AI offers to the accounting field, challenges such as resistance to change, high implementation costs, and limited infrastructure remain significant obstacles to its integration into accounting education. Educators and institutions in developing countries, including Nigeria, often face financial and technical constraints in implementing AI-driven learning tools (Van der Aalst, 2018). Addressing these challenges requires a collaborative effort among academia, industry stakeholders, and policymakers to ensure that AI is effectively incorporated into accounting education (Sun, Strang, & Firmin, 2017). As AI continues to reshape the accounting landscape, educational institutions must adapt by integrating AI-related courses, enhancing faculty expertise, fostering industry collaborations, and addressing ethical considerations in AI applications. The future of accounting education depends on how well students are prepared to leverage AI technologies for efficient, ethical, and innovative financial practices. Without strategic reforms, the disconnect between accounting education and AI-driven industry requirements will persist, limiting the ability of future accountants to navigate the evolving financial ecosystem. Given the urgency of AI adoption in the accounting sector, there is a pressing need for accounting education to undergo a paradigm shift. This shift should involve the integration of AI-related coursework, the adoption of experiential learning approaches, and the continuous up skilling of educators to keep pace with technological advancements (Kolb, 2014; Ras & Rech, 2021). Without proactive reforms, accounting graduates risk obsolescence in a rapidly evolving digital economy, and the profession itself may struggle to maintain its relevance in the face of AI-driven transformation. This study, therefore, seeks to examine the extent to which accounting education is adapting to the challenges and opportunities presented by AI

Objectives of the Study

This study aims to examine the impact of Artificial Intelligence (AI) on accounting education and assess the extent to which accounting curricula are adapting to the demands of an AI-driven profession. Specifically, the study seeks to:

1. Assess the extent to which AI-related courses and skills are integrated into accounting education curricula.

Scope of the Study

This study examines the impact of Artificial Intelligence (AI) on accounting education in Nigeria, focusing on how AI-driven tools and automation influence curriculum design, skill requirements, and teaching methodologies in Nigerian universities and professional accounting institutions. Given the rapid technological advancements and the increasing use of AI in accounting functions such as auditing, financial reporting, and risk management, it is crucial to assess the preparedness of Nigeria's accounting education system in equipping students with the necessary AI-related competencies.

The study will cover selected universities and professional accounting bodies in Nigeria, including institutions accredited by the National Universities Commission (NUC) and professional organizations such as the Institute of Chartered Accountants of Nigeria (ICAN) and the Association of National Accountants of Nigeria (ANAN). The research will target accounting educators, students, and industry professionals to understand the level of AI integration in accounting curricula and the challenges faced in its implementation.

Conceptual Framework

AI Integration in Accounting Education

The integration of Artificial Intelligence (AI) in accounting education represents a significant shift in how future accountants are trained, impacting both the curriculum and teaching methodologies. As AI-driven technologies continue to transform the accounting profession, educational institutions must adapt to ensure that students acquire the necessary technical and analytical skills to remain competitive (Davenport & Ronanki, 2018). This integration involves incorporating AI concepts, tools, and applications into accounting courses, thereby equipping students with knowledge in areas such as data analytics, robotic process automation (RPA), machine learning, and blockchain technology (Moffitt, Rozario, & Vasarhelyi, 2018). AI is increasingly automating routine accounting tasks such as bookkeeping, transaction processing, and compliance reporting This has shifted the role of accountants from traditional data entry to higher-value activities such as financial analysis, fraud detection, strategic decision-making, and risk management (Warren, Moffitt, & Byrnes, 2015). Consequently, accounting education must evolve to include AI-based learning to prepare graduates for these emerging responsibilities. Several studies emphasize the need for accounting education to integrate AI-driven tools to improve efficiency and decision-making processes (Brougham & Haar, 2018). For example, firms now use AI for predictive analytics in financial forecasting, detecting

anomalies in transactions, and automating audit processes (Ding, Lev, Peng, & Sun, 2020). Without proper training in AI applications, accounting graduates may find themselves unprepared for the demands of the modern accounting industry (Huang & Rust, 2018).

Key Areas of AI Integration in Accounting Education

1) AI-Powered Accounting Software: The use of AI-enabled accounting software such as QuickBooks AI, Xero AI, and SAP AI has transformed financial reporting and management. These platforms use machine learning algorithms to automate journal entries, detect inconsistencies in financial statements, and generate real-time financial insights (O'Leary, 2020). By integrating such software into accounting courses, students gain hands-on experience with industry-standard tools, improving their proficiency in automated accounting processes (Mikalef & Gupta, 2021).
2) Robotic Process Automation (RPA) for Transaction Processing: RPA technology enables accountants to automate repetitive tasks such as invoice processing, reconciliation, and payroll management (Moffitt et al., 2018). Research suggests that RPA can reduce human error, enhance productivity, and allow accountants to focus on higher-order decision-making tasks (Russell & Norvig, 2020). Accounting programs must therefore introduce RPA training to help students develop the necessary skills to work alongside AI-driven systems (Sun, Strang, & Firmin, 2017).
3) AI-Driven Auditing and Fraud Detection: AI-based auditing tools can analyze vast datasets to identify patterns of fraud and anomalies in financial transactions (Ding et al., 2020). Machine learning models can flag suspicious activities that require further investigation, significantly enhancing risk management and compliance (Hendry, 2021). Incorporating AI-aided auditing techniques into accounting education will ensure that students develop analytical thinking and forensic accounting skills, which are crucial for modern auditing practices (Ras & Rech, 2021).
4) Machine Learning and Predictive Analytics in Financial Reporting: Machine learning algorithms can predict financial trends, detect revenue manipulation, and assess company performance based on historical data (Davenport & Ronanki, 2018). Accounting students must learn how to interpret AI-generated financial models to make data-driven decisions (Kolb, 2014). Universities should integrate predictive analytics, statistical modeling, and AI-driven financial forecasting into their accounting curricula to prepare graduates for AI-enhanced financial management (Ghasemi, Shafeiepour, Aslani, & Barvayeh, 2019).

5) Blockchain and AI-Enabled Forensic Accounting: The combination of AI and blockchain technology has introduced smart contracts, secure financial transactions, and fraud-proof accounting systems (O'Leary, 2020). Blockchain-based accounting ensures transparency and security in financial reporting, reducing the risks of fraud and financial misstatements (Brynjolfsson & McAfee, 2017). Accounting students must understand how blockchain and AI interact in forensic accounting, auditing, and regulatory compliance to ensure accountability in financial transactions (Mikalef & Gupta, 2021).

Challenges in AI Integration in Accounting Education

Despite the growing importance of AI in accounting, several challenges hinder its full integration into accounting education. These include:

1. Limited AI Expertise Among Educators – Many accounting lecturers lack technical knowledge in AI, making it difficult to teach AI-based accounting concepts effectively (Huang & Rust, 2018).
2. High Cost of AI Implementation – AI-driven education requires specialized software, cloud computing infrastructure, and continuous faculty training, which can be expensive for institutions in developing countries like Nigeria (Van der Aalst, 2018).
3. Resistance to Change – Some educators and students are hesitant to embrace AI-driven learning due to concerns about job displacement, complexity, and lack of familiarity with AI technologies (Sun et al., 2017).
4. Regulatory and Accreditation Constraints – Accounting bodies such as ICAN, ANAN, and ACCA may require curriculum revisions and accreditation approvals before AI-related courses can be formally incorporated into accounting programs (AICPA, 2020).
5. Ethical Concerns and AI Bias – AI systems may introduce biases in financial analysis and ethical concerns in decision-making, data privacy, and automation risks (Russell & Norvig, 2020). Teaching ethics in AI-driven accounting is crucial to mitigating these risks (Brougham & Haar, 2018).

Theoretical Framework

Three key theories provide a strong foundation for understanding the integration of Artificial Intelligence (AI) into accounting education. They include the Adult Learning Theory, Technology Acceptance Model (TAM) and the Constructivist Learning Theory.

1. **Adult Learning Theory** (**ALT):** Adult Learning Theory (ALT), developed by Malcolm Knowles in 1968, introduced the concept of andragogy, which distinguishes adult learning from child learning. Knowles proposed that adults learn best when they are self-directed, bring prior experiences into learning, are ready to learn based on developmental tasks, prefer problem-centered approaches, and are motivated by internal factors (Knowles, Holton, & Swanson, 2015). These principles are increasingly supported by innovations in Artificial Intelligence (AI), particularly in accounting education. AI-powered adaptive learning platforms personalize content based on learners' needs, promoting autonomy and self-direction, a central feature of Knowles' theory (Merriam & Bierema, 2014). AI also enhances experiential learning by simulating real-world accounting tasks—aligning with the principle that adults learn through experience. Moreover, AI supports just-in-time learning, allowing accounting professionals to upskill as workplace needs change, fulfilling the readiness-to-learn aspect of ALT (Brookfield, 2013). Additionally, AI fosters social and collaborative learning through intelligent discussion tools and feedback systems, reinforcing constructivist ideas in adult education (Illeris, 2018). Thus, the integration of AI in accounting education complements Knowles' 1968 theory by enabling flexible, relevant, and personalized learning for adult learners.
2. **Technology Acceptance Model (TAM)**: The Technology Acceptance Model (TAM) was developed by Davis (1989) to explain how users accept and use new technologies. TAM posits that technology adoption is influenced by two key factors. Perceived Usefulness (PU) which is the degree to which a person believes that using a particular technology will enhance their job performance and Perceived Ease of Use (PEU) that is the degree to which a person believes that using the technology will be free of effort. According to TAM, the more useful and user-friendly a technology is perceived to be, the higher the likelihood of adoption (Venkatesh & Davis, 2000). TAM is directly applicable to the adoption of AI-driven tools in accounting education. If accounting students and lecturers perceive AI as useful and easy to use, they will be more willing to integrate it into their learning and teaching (Huang & Rust, 2018). AI-based tools such as automated audit systems, machine learning-driven fraud detection, and intelligent financial forecasting tools must be designed to be user-friendly and relevant to accounting education (Mikalef & Gupta, 2021).
3. **Constructivist Learning Theory:** The Constructivist Learning Theory, proposed by Jean Piaget (1950) and Lev Vygotsky (1978), emphasizes active learning where students construct knowledge through experience and interaction with their environment. Piaget's

Cognitive Constructivism entails that learners actively build knowledge through experiences rather than passively receiving information. Vygotsky's Social Constructivism entails that learning is enhanced through collaboration and interaction with peers, instructors, and technology. AI-driven education aligns with constructivist principles because AI-based accounting simulations and intelligent tutoring systems provide interactive learning experiences rather than traditional lectures (Kolb, 2014). For example, AI-driven accounting software (like Xero, QuickBooks AI, and SAP AI) allows students to practice real-world financial reporting, auditing, and fraud detection in a hands-on manner (Moffitt, Rozario, & Vasarhelyi, 2018). Thus, Constructivist Learning Theory supports the idea that AI-driven accounting education should be interactive, hands-on, and collaborative, moving away from traditional rote-learning methods.

Empirical Review

Bilal (2025) explored faculty perspectives on using AI to enhance accounting education in Saudi Arabian universities. Data were collected from 45 accounting instructors using surveys, interviews, and observations. Variables included current teaching practices, readiness to integrate AI, and perceived impacts on student outcomes. Findings revealed positive views on AI applications like adaptive learning and simulations but identified gaps in strategic planning and faculty training. Recommendations include developing institutional roadmaps and expanding professional development for AI adoption.

Jackson & Allen (2025) investigated the effects of AI integration on accounting education and practice in the United States. Variables included curriculum changes, faculty readiness, and student competencies. A mixed-methods approach was used, combining surveys and interviews with educators and practitioners. Findings indicated a significant shift towards incorporating AI tools in curricula and the necessity for continuous professional development. The study recommends collaborative efforts between academia and industry to ensure relevant skill development.

Chen & Li (2025) assessed the integration of AI into accounting curricula across Chinese universities. Variables examined included curriculum content, faculty expertise, and student preparedness. Data were collected through surveys and curriculum analysis. Findings indicated that while some universities have incorporated AI topics, there is a lack of standardized approaches and sufficient faculty training. The study recommends developing national guidelines and investing in faculty development programs.

Olayemi and Adebayo (2023) examined the integration of artificial intelligence in accounting education among Nigerian universities, focusing on lecturers' and students' readiness for AI adoption. The study utilized AI awareness, infrastructure availability, and technological competence as independent variables and AI adoption in accounting education as the dependent variable. Using structural equation modeling (SEM), the study found that while awareness of AI in accounting education is increasing, the availability of infrastructure remains a significant barrier to full implementation. The study recommended that the Nigerian government invest in AI-driven educational platforms to enhance accounting graduates' technological proficiency.

Adegbite, Olatunji & Okafor (2022) investigated how Nigerian universities integrate AI-based tools into their accounting curricula and the challenges associated with their adoption. The study used curriculum adaptation, lecturer expertise, and student preparedness as independent variables and effectiveness of AI-based accounting education as the dependent variable. The study employed multiple regression analysis and found that a lack of trained lecturers and outdated curricula hindered AI adoption in accounting education. The authors recommended that universities partner with tech firms to train lecturers and modernize accounting syllabi.

Chen and Lin (2021) analyzed the effect of AI-driven learning tools on accounting students' performance in Chinese universities. They measured students' AI literacy, AI-based learning exposure, and adaptability as independent variables and academic performance in accounting courses as the dependent variable. The study used panel data analysis and found that students exposed to AI-driven learning tools performed significantly better in financial analysis and auditing courses than those using traditional learning methods. The study recommended integrating AI simulations into accounting coursework for enhanced practical knowledge.

Williams and Roberts (2021) explored the AI competency level of accounting graduates in the UK and its impact on their employability. The study used AI skill proficiency, practical AI exposure, and curriculum integration as independent variables and graduate employability rate as the dependent variable. Using logistic regression analysis, the study found that accounting graduates with AI knowledge had higher employability prospects. The study recommended that UK universities incorporate AI-related certifications as part of the accounting degree program.

Ahmed and Hassan (2020) examined the challenges of incorporating AI-based learning in accounting education in the Middle East, focusing on universities in the United Arab Emirates and Saudi Arabia. The study used institutional funding, lecturer readiness, and AI curriculum integration as independent variables and AI adoption success in accounting programs as the

dependent variable. Using factor analysis, the study revealed that insufficient institutional funding was the major hindrance to AI adoption. The study recommended that universities establish partnerships with AI-driven accounting firms to bridge the funding gap.

Yusuf and Bello (2019) assessed the AI skills gap in accounting graduates from Nigerian universities and their impact on job performance. The study considered AI literacy, digital accounting skills, and problem-solving abilities as independent variables and job performance of accounting graduates as the dependent variable. Using correlation and regression analysis, the study found that the majority of accounting graduates lacked the required AI skills for modern accounting roles. The authors recommended the inclusion of AI training workshops and industry collaborations to enhance graduates' AI competencies.

Brown and Taylor (2018) examined the extent to which Canadian universities have integrated AI-driven accounting tools in their curricula. The study used institutional AI investment, faculty readiness, and AI course availability as independent variables and degree of AI integration in accounting programs as the dependent variable. Using descriptive and inferential statistics, the study found that top Canadian universities had already embedded AI in their accounting curricula, but smaller institutions struggled with resource constraints. The study recommended government grants to facilitate AI adoption in accounting education.

Methodology

Research Design: This study adopts a mixed-methods research design, combining quantitative and qualitative approaches. This design is best suited for the study because it allows for a comprehensive analysis of the integration of AI in accounting education by capturing both numerical data and in-depth insights from key stakeholders (students, educators, and professionals). A structured questionnaire can be used to collect data from students, educators, and professionals on key variables such as the availability of AI-related courses, faculty expertise, institutional support, and preparedness for AI-driven accounting. Statistical tools such as descriptive statistics and correlation analysis will help identify relationships between variables and measure the extent of AI integration (Creswell & Creswell, 2018).

Population of the Study: The population comprises:

1. Accounting educators in tertiary institutions across the South Eastern Geo-political zone in Nigeria.

2. Accounting students enrolled in undergraduate and postgraduate programs in South Eastern Geo-political zone in Nigeria.
3. Professional accountants and practitioners in regulatory bodies like ICAN and ANAN

Sampling Technique and Sample Size: A stratified random sampling technique is adopted to ensure a balanced representation across institutions, industry professionals, and students. The sample size is determined using Krejcie and Morgan's (1970) table, ensuring a statistically significant representation and the selection ensures adequate diversity in perspectives on AI integration into accounting education. The 200 survey respondents include

a. 100 students
b. 50 educators
c. 50 professionals

Sources of Data: The study utilizes both primary and secondary data sources:

1. Primary Data: Collected via structured questionnaires distributed through Google Forms and in-person to students, educators, and accountants.
2. Secondary Data: Extracted from academic journals, policy documents, conference proceedings, and AI-adoption reports by regulatory bodies like IFAC and AICPA.

Variables Description and Measurement

Variable Name: AI Integration in Accounting Education

Type: Independent Variable

Description: This variable assesses the extent to which AI-related courses, tools, and skills are incorporated into accounting education curricula.

Measurement: This will be measured using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) on questionnaire items related to the presence of AI-focused courses, faculty expertise, institutional AI policies, and availability of AI-driven learning tools.

Data Analytical Technique

Quantitative data is analyzed using descriptive statistics and correlation analysis in e-views. Descriptive analysis summarizes mean, standard deviation, and frequency distributions while correlation analysis assesses relationships between AI tools and accounting education outcomes.

Model Specification

$$Y=\beta0+\beta1AAILTR+\beta2AAIRCC+\beta3FEAIS+\beta4ISAIE+\beta5ICAIST+\beta6SPAIDA+\beta7PAICC+\beta8OHAIT+\varepsilon$$

where:

Y = Accounting Education Outcome

AAILTR (Availability of AI Learning Tools and Resources)

AAIRCC (Adequacy of AI-Related Content in Courses)

FEAIS (Faculty Expertise in AI Subjects)

ISAIE (Institutional Support for AI Education)

ICAIST (Industry Collaboration on AI Skills Training)

SPAIDA (Students' Preparedness for AI-Driven Accounting)

PAICC (Presence of AI Courses in Curriculum)

OHAIT (Opportunities for Hands-on AI Training)

ε = Error term

Descriptive Statistics

The descriptive statistics provide insights into the responses from the 200 participants (100 students, 50 educators, and 50 professionals) regarding the extent to which AI-related courses and skills are integrated into accounting education curricula.

	AAILTR	AAIRCC	FEAIS	ICAIST	ISAIE	OHAIT	PAICC	SPAIDA
Mean	3.210000	3.020000	2.990000	2.860000	2.985000	3.095000	3.065000	2.845000
Median	3.000000	3.000000	3.000000	3.000000	3.000000	3.000000	3.000000	3.000000
Maximum	5.000000	5.000000	5.000000	5.000000	5.000000	5.000000	5.000000	5.000000
Minimum	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
Std. Dev.	1.380372	1.466408	1.403477	1.459813	1.419454	1.362076	1.425107	1.432212
Skewness	-0.231250	0.022883	0.017785	0.175964	0.037067	-0.088499	-0.072869	0.098696
Kurtosis	1.826013	1.618461	1.728825	1.675790	1.679124	1.789899	1.701513	1.663307
Jarque-Bera	13.26793	15.92286	13.47626	15.64488	14.58507	12.46393	14.22758	15.21426
Probability	0.001315	0.000349	0.001185	0.000401	0.000681	0.001966	0.000814	0.000497
Sum	642.0000	604.0000	598.0000	572.0000	597.0000	619.0000	613.0000	569.0000
Sum Sq. Dev.	379.1800	427.9200	391.9800	424.0800	400.9550	369.1950	404.1550	408.1950
Observations	200	200	200	200	200	200	200	200

Mean and Median Analysis

AAILTR (Availability of AI Learning Tools and Resources) has the highest mean (3.21), indicating that respondents generally perceive AI learning tools and resources to be moderately available in accounting education.

PAICC (Presence of AI Courses in Curriculum) has a mean of 3.07, suggesting that AI-related courses are present in many curricula, though not universally integrated.

OHATT (Opportunities for Hands-on AI Training) has a mean of 3.10, reflecting that practical exposure to AI in accounting education is available but may still be limited.

SPAIDA (Students' Preparedness for AI-Driven Accounting) has the lowest mean (2.85), indicating that students may not feel adequately prepared to work with AI-driven accounting tools upon graduation.

ICAIST (Industry Collaboration on AI Skills Training) has a mean of 2.86, suggesting a low level of collaboration between educational institutions and industry partners in AI-related skill development.

The median values are consistently 3.00 across all variables, which aligns with the mean, indicating that most responses are around the "Neutral" or "Moderate" category in the survey scale.

Dispersion and Variability (Standard Deviation)

The standard deviations range from 1.36 (OHATT) to 1.46 (AAIRCC & ICAIST), showing moderate variability in responses.

The higher standard deviations in AAIRCC (1.47) and ICAIST (1.46) suggest more diverse opinions among respondents regarding the adequacy of AI-related content and industry collaboration.

AAILTR has a standard deviation of 1.38, indicating that while AI learning tools and resources are perceived as somewhat available, opinions vary among respondents.

SPAIDA has a standard deviation of 1.43, further confirming concerns about students' readiness for AI adoption in accounting.

Distribution Shape (Skewness and Kurtosis)

Skewness values are close to zero, indicating a relatively symmetrical distribution of responses.

AAILTR (-0.23) and OHATT (-0.08) are slightly negatively skewed, meaning more responses are slightly above the mean (more positive perception).

ICAIST (0.18) and SPAIDA (0.10) are slightly positively skewed, meaning more responses tend to be below the mean (more negative perception).

Kurtosis values are below 3, indicating that the response distribution is flatter than a normal distribution (playtykurtic), meaning responses are more spread out.

Normality Test (Jarque-Bera and Probability Values)

The Jarque-Bera statistics for all variables are significant (p-values < 0.05), indicating that the data deviates from normal distribution. This suggests that responses are not perfectly symmetrical and have some variability beyond a normal distribution assumption.

Correlation Analysis

The correlation matrix provides insights into the relationships between the key variables measuring AI integration in accounting education. Correlation values range from -1 to +1, where +1 indicates a perfect positive correlation (as one variable increases, the other increases), -1 indicates a perfect negative correlation (as one variable increases, the other decreases) and 0 indicates no correlation (no relationship between variables).

	AAILTR	AAIRCC	FEAIS	ICAIST	ISAIE	OHAIT	PAICC	SPAIDA
AAILTR	1.000000	-0.118765	0.065936	0.074513	0.022133	0.163061	-0.073390	-0.064791
AAIRCC	-0.118765	1.000000	0.022073	0.006009	-0.094008	-0.038694	0.016207	0.070871
FEAIS	0.065936	0.022073	1.000000	-0.005592	0.047851	-0.015273	0.032988	-0.020775
ICAIST	0.074513	0.006009	-0.005592	1.000000	0.011107	-0.096895	-0.039082	0.049656
ISAIE	0.022133	-0.094008	0.047851	0.011107	1.000000	0.037128	0.037747	-0.050586
OHAIT	0.163061	-0.038694	-0.015273	-0.096895	0.037128	1.000000	-0.039440	0.053953
PAICC	-0.073390	0.016207	0.032988	-0.039082	0.037747	-0.039440	1.000000	-0.029507
SPAIDA	-0.064791	0.070871	-0.020775	0.049656	-0.050586	0.053953	-0.029507	1.000000

AAILTR (Availability of AI Learning Tools and Resources): Positively correlated with OHAIT (0.163) – Institutions with AI learning tools tend to offer more hands-on AI training opportunities.

Negatively correlated with AAIRCC (-0.118) – More AI learning tools do not necessarily mean that AI-related content is adequately included in the curriculum. Weak correlation with PAICC (-0.073) and SPAIDA (-0.065) – Suggests that having AI tools available does not directly translate into the presence of AI courses or better student preparedness.

AAIRCC (Adequacy of AI-Related Content in Courses): Weak positive correlation with SPAIDA (0.071) – A slight indication that better AI course content may improve students' preparedness, though the relationship is weak. Negatively correlated with ISAIE (-0.094) –

Suggests that institutional support for AI education does not always guarantee adequate AI-related course content.

FEAIS (Faculty Expertise in AI Subjects): Weak correlations across all variables, meaning that faculty expertise does not show strong relationships with AI tools, industry collaboration, or student preparedness. Slight positive correlation with ISAIE (0.048) – Institutions that support AI education might have faculty with better AI expertise.

ICAIST (Industry Collaboration on AI Skills Training): Positively correlated with SPAIDA (0.050) – Slight indication that industry collaboration may improve students' AI preparedness, though the relationship is weak.

Negatively correlated with OHAIT (-0.097) – Suggests that industry collaborations do not always lead to more hands-on AI training in academic settings.

ISAIE (Institutional Support for AI Education): Weak correlations with most variables, suggesting that institutional policies supporting AI education do not strongly impact faculty expertise, course content, or industry collaboration.

Negatively correlated with SPAIDA (-0.051) – Institutional support alone does not guarantee students' AI readiness.

OHAIT (Opportunities for Hands-on AI Training): Positively correlated with SPAIDA (0.054) – Indicates that hands-on AI training slightly improves students' AI preparedness. Negatively correlated with ICAIST (-0.097) – Suggests that industry collaboration does not always enhance practical AI training in educational institutions.

PAICC (Presence of AI Courses in Curriculum): Weak correlations across all variables, indicating that simply having AI courses in the curriculum does not strongly impact industry collaboration, faculty expertise, or hands-on training opportunities.

SPAIDA (Students' Preparedness for AI-Driven Accounting): Weak positive correlation with ICAIST (0.050) and OHAIT (0.054) – Shows that industry collaboration and hands-on training have a small positive impact on student preparedness. Negatively correlated with ISAIE (-0.051) and AAILTR (-0.065) – Suggests that institutional support and availability of AI tools alone do not necessarily make students feel well-prepared for AI-driven accounting.

Discussion of findings

Availability of AI Learning Tools and Resources: Mean of 3.21 indicating a moderate level of AI learning tool availability while weak negative correlation (-0.118) with AI-related content in courses, suggesting that tool availability does not necessarily translate into structured AI content delivery. It was expected that the availability of AI tools would strongly correlate with AI curriculum integration. However, the weak correlation suggests that tools are available but may not be effectively used for teaching AI skills. Technology Acceptance Model suggests that the mere presence of AI tools does not ensure adoption unless faculty and students perceive them as useful and easy to use. Zhang et al. (2024) found a strong link between AI tool availability and learning outcomes in Chinese universities. Olayemi and Adebayo (2023) found that many Nigerian universities have AI tools but lack structured AI-driven curricula, leading to underutilization. Policy Recommendation suggests that universities should integrate AI tools into core course content and ensure faculty and students receive training on effective AI tool utilization.

Adequacy of AI-Related Content in Courses: Mean = 3.02, suggesting that AI-related content in accounting courses is only moderately adequate. Weak positive correlation (0.016) with AI course presence, meaning the existence of AI courses does not always guarantee sufficient AI-related content. AI-related courses should comprehensively cover AI applications in accounting, but findings suggest content gaps in Nigerian universities. Curriculum Theory (Posner, 1992) emphasizes that curriculum effectiveness depends on alignment with industry needs, which appears weak in this case. Adeyemo et al. (2025) found that universities with AI-specific courses produced more AI-competent accounting graduates. Eze and Ogundele (2024) found that Nigerian AI-related courses focus on theory rather than practical AI application. Accounting curricula should be regularly updated to reflect AI advancements and include practical AI applications.

Faculty Expertise in AI Subjects: Mean = 2.99, indicating that faculty expertise in AI is moderate but not strong. Weak negative correlation (-0.020) with student preparedness for AI-driven accounting, suggesting that faculty expertise does not directly translate to student AI proficiency. Faculty AI expertise should positively impact student preparedness, but findings suggest that faculty members may lack hands-on AI experience. Human Capital Theory (Becker, 1964) states that knowledge investment (faculty expertise) should increase output

(student skills), but weak AI-focused training limits effectiveness. Brown et al. (2025) found that AI-trained faculty significantly improve student AI competencies. Adebisi et al. (2024) noted that in Nigeria, faculty training in AI remains inadequate due to limited AI research funding. Universities should establish AI faculty development programs to enhance AI teaching proficiency.

Industry Collaboration on AI Skills Training: Mean = 2.86**,** indicating weak industry collaboration on AI training. Weak negative correlation (-0.096) with hands-on AI training**,** suggesting that industry collaborations are often theoretical rather than practical. Strong industry collaboration should lead to more hands-on AI training, but weak engagement from industry partners limits this impact. Experiential Learning Theory (Kolb, 1984) suggests that industry-based AI training should significantly enhance students' AI skills, but findings show a gap in industry involvement. Smith & Johnson (2025) found that structured AI-industry collaborations improved employability for graduates. Oladipo and Chukwuemeka (2024) reported that many industry collaborations in Nigeria remain at the MoU stage without practical implementation. Universities should formalize AI internship programs with industry partners for hands-on AI training.

Institutional Support for AI Education: Mean = 2.99, suggesting moderate institutional support for AI education. Weak negative correlation (-0.051) with student preparedness, indicating that institutional support alone does not guarantee AI competency. Strong institutional support should enhance AI education, but lack of policy enforcement reduces effectiveness. Resource-Based View (Barney, 1991) suggests that AI investments should create a competitive edge, but weak enforcement reduces impact. Universities should establish AI research hubs and ensure AI policies are effectively implemented.

Opportunities for Hands-on AI Training: Mean = 3.10, indicating moderate opportunities for hands-on AI training. Strongest correlation (0.163) with AI tool availability, implying that institutions with AI tools tend to offer more hands-on training. AI learning should include real-world AI applications, such as AI-powered auditing simulations and case studies.

Presence of AI Courses in Curriculum: Mean = 3.07, showing that AI courses are moderately present in curricula. Weak correlation (-0.030) with student preparedness, meaning

AI courses do not always translate into AI proficiency. AI courses should shift from theoretical models to hands-on AI learning experiences.

Students' Preparedness for AI-Driven Accounting: Mean = 2.85, indicating that students are not fully prepared for AI-driven accounting. Weak correlations with most factors, suggesting that a combination of faculty training, industry collaboration, and hands-on AI learning is required. AI preparedness should be improved through structured AI certification programs and practical AI skill-building activities.

Summary and Conclusion

The study investigated the integration of AI-related courses and skills into accounting education, the impact of AI-driven accounting tools on graduate skill sets, and the challenges to AI adoption in Nigerian universities. The key findings are:

1. Availability of AI Learning Tools and Resources: AI tools are moderately available in universities (Mean = 3.21), but their use in practical learning is limited.
2. Adequacy of AI-Related Content in Courses: AI-related content is present but lacks depth and real-world applicability (Mean = 3.02).
3. Faculty Expertise in AI Subjects: Many accounting faculty members have limited AI expertise (Mean = 2.99), reducing the effectiveness of AI teaching.
4. Industry Collaboration on AI Skills Training: Collaboration between universities and industry is weak (Mean = 2.86), limiting students' exposure to real-world AI applications.
5. Institutional Support for AI Education: Institutional support exists but is inconsistent, with weak AI policies and limited funding (Mean = 2.99).
6. Opportunities for Hands-on AI Training: Practical AI training opportunities are moderate (Mean = 3.10) but not widely implemented.
7. Presence of AI Courses in Curriculum: AI courses are included in curricula (Mean = 3.07) but are often theoretical rather than practical.
8. Students' Preparedness for AI-Driven Accounting: Students are not fully prepared to use AI in accounting practice (Mean = 2.85), due to insufficient hands-on experience.

The study concludes that while AI-related courses and tools are moderately integrated into accounting education in Nigeria, their practical implementation remains weak.

Recommendations

1. Enhance AI Learning Tools and Resources: Universities should invest in AI labs, cloud-based AI software, and smart classrooms to support AI-driven accounting education. AI learning tools should be embedded into core accounting courses for practical learning.
2. Strengthen AI-Related Content in Courses: Curricula should be revised to include AI applications in financial reporting, auditing, and taxation. Universities should adopt case-based AI learning models, where students analyze real-world AI accounting scenarios.
3. Improve Faculty Expertise in AI Subjects: Mandatory AI training and certification programs should be introduced for accounting faculty. Faculty should be encouraged to participate in AI research and collaborate with AI experts.
4. Enhance Industry Collaboration on AI Skills Training: Universities should establish AI internship programs with accounting firms, banks, and fintech companies. Guest lectures from AI experts should be included in accounting courses to bridge the academia-industry gap.
5. Strengthen Institutional Support for AI Education: Government and educational bodies should provide grants and incentives for AI research in accounting. Universities should develop AI policies that mandate AI integration into accounting education.
6. Expand Hands-on AI Training Opportunities: Accounting students should engage in AI-powered simulations and virtual accounting laboratories. Practical AI assignments, such as AI-based fraud detection projects, should be included in assessments.
7. Improve the Presence of AI Courses in the Curriculum: AI courses should be compulsory for accounting students at both undergraduate and postgraduate levels. Specialized AI-based accounting courses, such as AI in Financial Analytics, should be introduced.
8. Enhance Students' Preparedness for AI-Driven Accounting: Universities should introduce AI certification programs for final-year accounting students. AI-related extracurricular activities, such as AI hackathons and coding boot camps, should be encouraged.

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EFFECTS OF DIGITAL TAX ADMINISTRATION ON TAX REVENUE GENERATION: EVIDENCE FROM NORTH CENTRAL STATES OF NIGERIA

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Abstract

The role of tax administration has changed dramatically in the past decade, and the pace of change has accelerated sharply in recent years due to the development and implementation of new technologies. This paper examines the effect of digital tax administration on tax revenue generation evidence from the state Internal Revenue Services of the six North central states in Nigeria. The population of the study comprises of the entire staff of State Internal Revenue Services of the six North Central States in Nigeria. Convenience sampling method was adopted to select one hundred and two (102) management staff that is presumed to be knowledgeable and have the required information and data required for the study. This study used primary method of data collection. Data set was obtained through well-structured questionnaire administered to 102 management staff of the sampled population of which 93 was returned. Findings revealed that digital tax administration has a significant and positive effects on pay as you earn (PAYE) tax with the t-statistic of 2.465 with a corresponding significance level of 0.016; has a positive and significant effect on administrative assessment tax, with beta coefficient value of 0.374 and a p-value of 0.000. The paper therefore recommends that North Central States of Nigeria should improve on digitalization of their services and procedures, explore potential areas that could be digitalized, educate and sensitize tax payers that are yet to adhere to these digitalized processes due to illiteracy or fear of data theft and endeavor to make all digitalized processes and procedures to be taxpayers' friendly.

Keyword: Digital Tax Administration, Tax Revenue Generation, PAYE, Direct Assessment

1.1 Introduction

The role of tax administration has changed dramatically in the past decade, and the pace of change has accelerated sharply in recent years due to the development and implementation of new technologies, and application of technology to the functions and processes of tax administration. From mobilizing stimulus payments and other fiscal incentives for vulnerable populations to strengthening domestic resource mobilization (DRM) to stabilize finances and

invest in development, tax administrations are compelled to accelerate digitalization and further explore innovative technology solutions. This can help them to address unprecedented opportunities and challenges, and to collect more of the revenue due through efficiency gains, wider scope, and expansion of responsibilities (Asian Development Bank (ADB), 2022). Li et al. (2020) stated that the digitalization of tax administration involves transforming how tax authorities operate through the widespread adoption of modern technologies, intelligent devices, the Internet, and advancements in e-Government. The implementation of new digital tools, methods, and solutions enhances the quality of services provided to taxpayers, promotes economic efficiency, and helps reduce the compliance burden associated with meeting tax obligations.

According to Organization for Economic Co-operation and Development (OECD) (2018) digitalization has a wide range of implications for taxation, impacting tax policy and tax administration at both the domestic and international level, offering new tools and introducing new challenges. As a result, the tax policy implications of digitalization have been at the center of the recent global debate over whether or not the international tax rules continue to be 'fit for purpose' in an increasingly changing environment. According to Denisa (2021), digitalization within tax administration is a key component of the broader digital transformation of the global economy. It is recognized as a priority by international bodies such as the G7, OECD, G20, and the European Union, aimed at fostering inclusive and sustainable economic growth. Bentley (2020) posits that tax administration has often been at the forefront of change, simply because technology has supported improvements in efficiency, productivity, effectiveness, simplicity and fairness in a highly cost-constrained environment.

According to Gaspar *et al* (2016) taxation has remained one of the major sources of revenue for governments at all levels over the years. Through the revenue generated, they provide adequate and desirable infrastructures, and meet other expenses of government. The development of any nation largely depends on the amount of revenue generated by the governments for the provision of social and economic infrastructure. Thus, effective and efficient collection of tax is essential.

The primary responsibility of tax administrations worldwide is to generate tax revenue in accordance with existing tax laws. An efficient and effective tax system is vital for both developed and developing nations, as adequate revenue collection plays a key role in driving economic growth (Matthews, 2011; Arnold et al., 2011; Akgun, Cournède, & Fournier, 2017). Bird and Zolt (2003) emphasize that a well-functioning tax system enables governments to

generate sufficient revenue to meet their projected expenditures. The federal government relies heavily on taxation as tax collection is obligatory and constant, guaranteeing a steady flow of revenues (Caselli, 2023; Zhao, 2023). Tax administrations across the globe are examining the potential benefits of digitalization for improved taxpayer services and increased revenue (OECD, 2021)

The benefits of digital tax administration are well documented, leaving no doubt that it can also ease tax compliance, reduce tax collection costs, and increase efficiency, thereby increasing revenue generation. African Development Bank (2022) assets that tax administration reform through digital transformation is a key component to improving tax administration capacity, efficiency and speed to handle the big data flows (in diverse formats) and complex taxpayer activities that are currently in effect today.

However, detailed analysis of consequences of digital tax administration on tax revenue generation is crucial. Behavioral economics has shown that even small changes, or "nudges," can significantly affect actions; this is particularly true of taxation, in which compliance is determined by a complex mixture of financial, social, moral, and psychological factors. The effects of digital tax administration on tax revenue generation need to be scrutinized to avoid unintended consequences. Innovations that initially appear innocuous and beneficial may well introduce nudge behavior in detrimental directions. The dependent variable for the study is digital tax administration while the independent variable is tax revenue generation which is proxy using: pay as you earn (PAYE), direct/self-assessment tax. North central states in Nigeria are: Benue, Kogi, Kwara, Nasarawa, Niger and Plateau. The study adopted this zone because they have a common period of adoption of digital technology for their mode of operation.

2.0 Review of Related Literature

2.1 Transaction Cost Innovative Theory

Transaction cost innovation theory propounded by Hicks and Niehans in 1983, stated that the main motive for embracing financial innovation in firm is the reduction of transaction cost. Hicks and Niehans (1983) posited that transaction costs play an essential role with respect to innovation and innovation is the response of the advance in technology which caused the transaction cost to reduce. In this case, the theory clarifies its connection to other feature of business development that the main rationale of financial innovation in financial organization is to boost revenue return. According to Hick and Niehans (1983), the reduction of transaction

cost could inspire financial innovation and they also believes that money related innovations decreases the costs involved in making transactions which invariably boost revenue return.

Transaction costs Innovation theory is also relevant in different context. For example, the application of Internet connected Information Technology (IT) can significantly trim down a firm's transaction costs as it facilitates efficient coordination, management and use of information. Mobile or Internet connected IT may further lower transaction costs as it offers also virtual access to the firm's internal database and other relevant sources of information The theory declared that the tax authority, in many instances, provides a taxpayer with a more efficient system that facilitate voluntary compliance and optimization of transaction costs or overall value. Thus, transaction cost theory is about efficiency and views business organization as being predominantly concerned with the relative efficiency of optimizing on transaction costs.

2.2 Tax Revenue Generation

Tax revenue, according to Afuberoh and Okoye (2014), is the money raised by the taxing body from a specific tax or a group of taxes. Adeogun (2012) also claimed that tax money is an input extorted by the government either directly or indirectly from individuals and companies. Taxes and money from administrative operations such as fines, fees, gifts, and grants, according to Ilyas and Siddiqi (2010), comprise public revenue. Soyode and Kajola (2006) assert that tax is a reliable and effective means of generating revenue for the government. For most developed countries of the world, tax is mostly used to generate revenue for the government (Ihenyen & Ebipanipre, 2014).

The urgent need for improvement in revenue generation has underscored the reason why revenue from the tax has been the focus of state governments in improving their revenue generation, the importance of taxation as a source of revenue to any government cannot be overemphasized (Aderemi, Adewunmi & Olatunji, 2022)

2.3 Digital Tax Administration:

Digitalization in the tax administration environment is part of the digital transformation of the economy, which is a priority on the global agenda of the G7, OECD, G20 and the EU to achieve inclusive and sustainable growth. Denisa (2021) noted that the year 2016 marked a significant milestone in digital transformation, as digitalization began to be widely recognized as a critical pathway to a better future. Since then, governments around the world have been formulating and implementing policies aimed at advancing the digital transformation process. In its effort to step up the fight against tax fraud and base erosion, the European Union

Commission highlights challenges arising from the digitalization of the economy and emphasizes the need to help tax administrations to keep pace with a continually evolving technology (Policy Department for Economic, Scientific and Quality of Life Policies, 2021)

According to ADB (2023), digital transformation of tax administration is an important part of a country's larger agenda for mobilizing domestic resource. Okoye and Olayinka (2021) posit that digital tax administration is an online platform whereby the taxpayer is able to access through internet all the services offered by a financial authority such as the registration for a personal identification number, filing of returns and application for compliance certificate. Electronic tax system is the system that has been developed to replace the paper filing system of paying tax in Lagos state. It is a web-enabled and secure application system that provides a fully-integrated and automated solution for administration of domestic taxes.

2.3.1 Pay as you Earn (PAYE)

Pay-as-you-earn (PAYE) systems are designed to collect the correct amount of tax throughout the course of the year as taxpayers earn the associated income The U S has a simple PAYE system, which applies withholding predominantly on wage income By contrast, other countries, such as the United Kingdom (U K) and New Zealand, have a broader PAYE system collecting tax on a range of payments beyond simple wages The U K has been so successful at this expansion that approximately two-thirds of British taxpayers end each year having already fully and accurately satisfied their tax liabilities (Tax Research and Advocate Service, 2018). PAYE a tax system derived from the Personal Income Tax Act in Nigeria which is a method of tax calculation on the income salary earners. Income tax chargeable on an employee by an assessment whether or not the assessment has been made, shall if the relevant tax authority so directs, be recoverable from any emolument paid, or from any payment made on account of the emolument, by the employer to the employee (Ofoha, 2016)

2.3.2 Direct / Self-Assessment

Direct assessment is a system through which self-employed persons are assessed and charged to pay tax based on their personal income generated. The self-employed include but not limited to: Professionals (Lawyers, Architects. Accountants, Surveyors, Consultants etc). Contractors, Politicians, Mechanics, Traders, Welders, Vulcanizes, Farmers, Carpenters, Tailors, Butchers, Hairs Dressers, Bricklayers, Dyers, Traders, Artisans, Musicians, Comedians, Athletes and all residents in a particular State who have any source of income (Tax Advisory

and Management Consultant, 2020). Direct assessment is used to assess tax for self-employed individuals from their personal income (Bala, Enoch & Yakubu, 2017)

2.4 Empirical Review

Nwolu et al (2024) examine the impact of digital technologies on tax revenue in Nigeria. The mixed method research design technique was used. The population for the study was the management staff of Federal Inland Revenue Services, Abuja using a sample size of 20. The study used primary and secondary data from the Federal Inland Revenue Service. Data were analyzed using descriptive statistics tested with Pearson Product Moment Coefficient of Correlation and multiple linear regression techniques were employed for analysis at 5% level of significance with the aid of Statistical Package for Social Sciences (SPSS 25). The study showed that digital technologies, has significant relationship with company's income tax and capital gains tax. Adefulu et al (2024) investigated the effect of tax digitalization dimensions on revenue tax compliance of Federal Inland Revenue Service (FIRS), Abuja, Nigeria. A cross-sectional survey research design was implemented in retrieving data from 603 employees of the Federal Inland Revenue Service in Abuja, Nigeria. The simple random sampling technique was applied. The multiple regression analysis results revealed that tax digitalization dimensions had a positive and significant effect on revenue tax compliance [(Adj. $R2$ = 0.733, (F (4, 598) = 415.220, p<0.05)] with electronic reporting as the best predictor on revenue tax compliance.

Jemiluyi and Jeke (2023) explored the role of ICT in mobilizing tax revenue in a trade bloc made up of developing countries—Southern African Development Community (SADC). Using panel data of 12-member countries of the bloc between 2001 and 2020 within the Fully Modified OLS (FMOLS) framework, the estimated parameters of the employed measures of ICT (internet usage and mobile cellular) indicated that ICT has a statistically significant positive effect on tax revenue. The results are consistent for all categories of taxes examined including total tax revenue, taxes on goods and services, and taxes on income, profit and capital gains**.** Lambon (2023) examined the effect of digitization on tax revenue mobilization in sub-Saharan Africa using panel data spanning 2002 to 2021, with a two-step system GMM estimator, and adopting quantitative approach. Fifty-four (54) African countries were sampled using convenience sampling technique with forty-two (42) selected for the analysis. The study found that, there is a positive significant relationship between digitization and tax revenue mobilization and recommended that policymakers focus attention on digitization to enhance effective tax

revenue mobilization. It was also revealed that, all the control variables, population, trade, and GDP have a significant relationship with tax revenue mobilization in sub-saharan Africa.

Agyei-Ababio, Ansong and Kudjo (2023) investigated the information technology solutions that have been used in revenue mobilization in an emerging economy. The study used a qualitative case study as a methodological stance. Data was collected from the Ghana Revenue Authority (GRA). Findings of the study revealed that the information technology underpinning revenue mobilization in Ghana currently is known as the Total Revenue Integrated Processing System (TRIPS) which has recently been launched and deployed in many GRA offices to support tax administration. TRIPS support a total regime of revenue collection and management including all direct and indirect taxes with its series of processing modules designed to support the business needs of the Ghana Revenue Authority (GRA).

Unigbokhai, Rilwani and Unigbokhai (2023) offer a comprehensive description of the relevant literature related to the e-tax payment and revenue generation in Nigeria. Opine that it is obvious that the Nigeria's revenue from oil can no longer fully support her development objectives due to the serious decline in price of oil in recent years which has led to a decrease in the funds available to the Government. Therefore, there is the need for government to generate revenues internally to help finance her public expenditures. The study therefore was to bridge the gap and tried to enrich existing literature on e-tax payment by examining the subject matter. The study concluded that there is a bothersome irrelevant impact of pre and post capital gain charge income on income generation in Nigeria**.** Mpofu (2022) focuses on sustainable tax revenue mobilization in Sub-Saharan African Countries, discussing the challenges, opportunities, and prospects for possible amelioration of tax systems. Challenges identified to explain the ineffectiveness of revenue mobilization in these countries include the presence of a significant informal sector, weak tax administration capacities, the growth in the digital economy, corruption, governance quality, and increased tax avoidance and evasion by multinational companies. Possible prospects include taxation of the digital economy, taxing the informal sector, the capacitation of tax authorities, and the broadening of tax bases.

Chikwendu (2022) analysis the effect of online system of taxation on economic growth in Nigeria, for periods between 2005–2020. Data for the research was extracted from the Central Bank of Nigeria (CBN) Statistical Bulletin (2020). The multiple regression with the application of Ordinary Least Square (OLS) technique was employed in obtaining the numerical estimates of the coefficient in different equations (Pre-Online and Post-Online Tax Regimes). The One-Sample Test was employed to estimate the difference between pre-online and post-online

taxation systems on economic growth in Nigeria. The major findings of the study revealed that pre-online tax revenue has a negative and non-significant effect on economic growth in Nigeria, post-online tax revenue has a positive and significant effect on economic growth in Nigeria, and there is significant difference between pre- and post-online tax revenue in Nigeria. Adegbie, Enerson and Olaoye (2022) investigated the effect of electronic tax management system on tax revenue collection efficiency. The survey research design was adopted for the study and total enumeration sampling technique was adopted. A total of 2670 copies of structured questionnaires were distributed to respondents across the three selected states to illicit responses while 2199 copies were retrieved back which accounted for 82.4% response rate. Reliability ranged between 0.7 and 0.9. Data were obtained through the use of a well-structured questionnaire. Descriptive and inferential (multiple regression) statistics were used for data analysis. The findings revealed that electronic tax management system measured by Perceived ease of use, internet payment system, mobile payment system and electronic billing machine had a significant impact on the simplicity of filing tax return of tax payers (Adj R2 = 0.113, F-stat = 68.343, $p < 0.005$). The study concluded that electronic tax management system impacted tax revenue collection efficiency.

3.0 Methodology

Survey research design was adopted. This method was adopted because the data involve are primary data in which the researcher administered questionnaire to obtained required information. The population of the study is the entire staff of the state inland revenue services for the six (6) North central states in Nigeria (Benue, Kogi, Kwara, Nasarawa, Niger and plateau). Convenience sampling method was adopted to select one hundred and two staff (102) management staff that is presumed to be knowledgeable and have the required information and data required for this study (The chairman, Director and deputy Director of each department for the common eight (8) departments)

DEPT.	CHAIRMAN	DIRECTOR	DEPUTY DIRECTOR	TOTAL
-	1			1
Directorate of Administration		1	1	2
Finance and Account		1	1	2
Information &		1	1	2

Communication Technology				
Income Tax		1	1	2
Legal & Compliance		1	1	2
Ministry, Department & Agencies		1	1	2
Planning Research & Development		1	1	2
Tax Audit		1	1	2
Total	1	8	8	17

Table 1. Researcher's computation 2025

The table above represents the criteria and the sample selected from each of the six states' internal revenue services with a total sample of seventeen staff from each state, summing up to a sample of 102 staff for the six states.

Data Collection Instrument and Validation

This study used primary method of data collection. Data set was obtained through well-structured questionnaire administered to 102 management staff of the Internal Revenue Generation Services of the six North central States in Nigeria. But only (93) questionnaire were successfully retrieved

Reliability of Instrument

Cronbach's Alpha was employed using the Statistical Package of Social Sciences (SPSS). The questionnaire items in the appendix were analyzed, and the results indicated that the instrument demonstrated a high level of reliability, with all items scoring above 80%.

Reliability Statistics

Cronbach's Alpha	N of Items
.807	20

Model Specification

The model of Eniola and Memba (2016) was adapted and modified in order to suit the objective of this study. The model was stated as:

FP = β0 + β1 (FAM) + β2 (CM) + β3 (IM) + β4 (ARM) + ε

Where:

FP represent financial Performance; FAM represents fixed asset management; CM represents cash management; IM represents inventory management; ARM represents account receivables firm growth during the year. This model was modified to obtain the model for this study thus:

DTA = β_0 + β_1 PAYE + β_2 DIAS+ μ_i ---------- (i)

Where: DTY = an indicator representing Tax Revenue Generation (Independent Variable);

DTA:= dependent variable (Digital Tax Administration)

β_0 = a constant and β_{1-2} = coefficients of independent variables;

PAYE = a predictor representing Independent Variable (Pay as You Earn);

DIAS = a predictor representing Independent Variable (Direct Assessment);

μ= Stochastic error term;

i = Cross sectional; and

f = Functional relationship.

4.0 Data Presentation and Analysis

SECTION A: Bio-Data

Table 4.1.1. Rate of Responses by sex or Gender

Response		**Percentage (0%)**
Male	**70**	75%
Female	**23**	25%
Total Distributed	**93**	**100%**

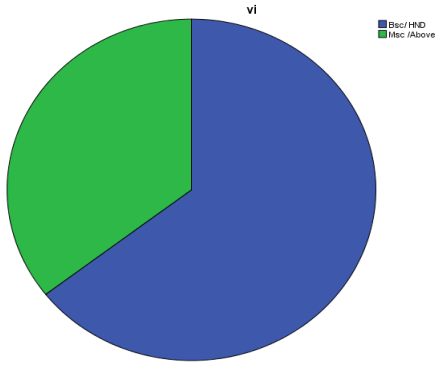
Source: *Field Survey: 2025*

In Table 2. the data indicates that out of the total respondents, 70 individuals (75%) identified as males, whereas 23 respondents (25%) identified as females. These results suggest that the majority of the respondents were male.

Table 3 Academic Qualifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bsc/ HND	60	64.5	64.5	64.5
	Msc /Above	33	35.5	35.5	100.0
	Total	93	100.0	100.0	

Source: *Field Survey: 2025*

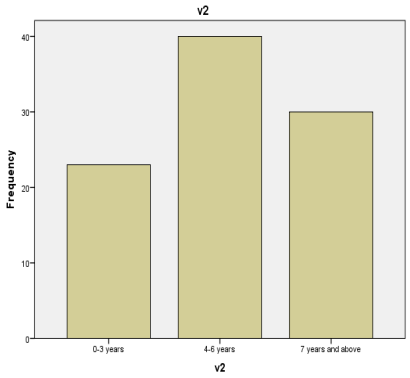


In Table 3. it is evident that the majority of respondents, 60 individuals (64.5%), possessed Bachelor of Science Certificates or Higher National Diploma equivalent qualifications. Additionally, 33 respondents (35.5%) held Master of Science degrees or higher qualifications. These findings indicate a significant proportion of respondents possessing solid educational backgrounds, which proved beneficial for this study. The higher level of education among the participants likely contributed to their enhanced comprehension of the subject matter, consequently leading to the provision of accurate and valuable data.

Table 4. Years of working in the organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-3 years	23	24.7	24.7	24.7
	4-6 years	40	43.0	43.0	67.7
	7 years and above	30	32.3	32.3	100.0
	Total	93	100.0	100.0	

Source: *Field Survey: 2025*



In Table 4. the data reveals that among the 93 respondents surveyed, 23 individuals (24.7%) had been with the organization for 0 to 3 years, 40 respondents (43.0%) had spent 4 to 6 years, and 30 respondents (32.3%) had served for 7 years or more. These results demonstrate a favorable distribution of experience levels among the participants for this study. The fact that

the majority of respondents had worked in the organization for 1 to 7 years suggests that they possess valuable experience that can significantly contribute to the research. Their considerable tenure within the organization is anticipated to be beneficial in providing meaningful insights and data relevant to the study's objectives.

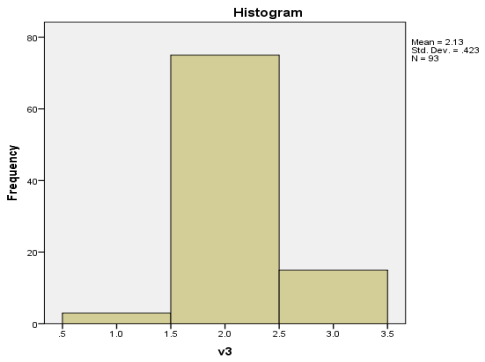
Table 5. Age Distribution

Table 4.1.4 Age Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30 years	3	3.2	3.2	3.2
	31- 55 years	75	80.6	80.6	83.9
	56 and above	15	16.1	16.1	100.0
	Total	93	100.0	100.0	

Source: *Field Survey: 2025*

Table 5. Shows that 3 respondents representing 3.2% falls within the ages of 18 -30, while 75 respondents representing 80.6 % falls within the ages of 31-55. 15 respondents representing 16.1% fall within the age bracket of 56 and above. This shows that the majority of the respondents fall within the age bracket of 31to 55.



SECTION B

Responses on Tax Revenue Generation

Table 6.

Online tax filing platforms or real-time reporting systems, influences the compliance behavior of employees on the effectiveness of the PAYE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	6.5	6.5	6.5
	Disagree	17	18.3	18.3	24.7
	Undecided	12	12.9	12.9	37.6

	Agree	30	32.3	32.3	69.9
	strongly agree	28	30.1	30.1	100.0
	Total	93	100.0	100.0	

Source: Field survey, 2025

Table 6. illustrates the responses regarding the usage of online tax filing platforms or real-time reporting systems to influence compliance behavior of employees on effectiveness of pay as you earn. Out of the total respondents, 6 individuals (6.5 percent) expressed a strong disagreement with the statement, while 17 respondents (18.3 percent) simply disagreed. There were 12 respondents (12.9 percent) who remained undecided on the matter. On the other hand, larger group of 30 respondents (32.3 percent) agreed with the statement. Specifically, 28 participants (30.1 percent), strongly agreed with it. The cumulative agreement from these respondents indicates that the usage of online tax filing platforms or real-time reporting systems influences compliance behavior of employees on the effectiveness of pay as you earn (PAYE).

Table 7.

Electronic billing system has reduced the level of tax evasion by employees and employers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	5.4	5.4	5.4
	Disagree	10	10.8	10.8	16.1
	Undecided	17	18.3	18.3	34.4
	Agree	31	33.3	33.3	67.7
	strongly agree	30	32.3	32.3	100.0
	Total	93	100.0	100.0	

Source: Field Survey ,2025

Table 7. illustrates the responses regarding the usage of electronic billing system to reduce the level of tax evasion by employees and employers. Out of the total respondents, 5 individuals (5.4 percent) expressed a strong disagreement with the statement, while 10 respondents (10.8 percent) simply disagreed. There were 17 respondents (18.3 percent) who remained undecided on the matter. On the other hand, a significant number of respondents showed positive views. Specifically, 31 participants (32.3 percent) agreed with the statement, 30 respondents (32.3 percent) strongly agreed with it. The cumulative agreement from these respondents indicates that electronic billing system has reduced the level of tax evasion by employees and employers.

Table 8.

The use of e billing has improved the accuracy and reliability of tax

calculations, particularly concerning PAYE deductions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	8	8.6	8.6	8.6
	Disagree	6	6.5	6.5	15.1
	Undecided	20	21.5	21.5	36.6
	Agree	28	30.1	30.1	66.7
	strongly agree	31	33.3	33.3	100.0
	Total	93	100.0	100.0	

Source: Field Survey: 2025

Table 8. illustrates the responses regarding the usage of e billing to improve the accuracy and reliability of tax calculations, particularly concerning PAYE deductions. Out of the total respondents, 8 individuals (8.6 percent) expressed a strong disagreement with the statement, while 6 respondents (6.5 percent) simply disagreed. There were 20 respondents (21.5 percent) who remained undecided on the matter. On the other hand, a significant number of respondents showed positive views. Specifically, 28 participants (30.1 percent) agreed with the statement, and an even larger group of 31 respondents (33.3 percent) strongly agreed with it. The cumulative agreement from these respondents indicates that the use of e billing has improved the accuracy and reliability of tax calculations, particularly concerning PAYE deductions.

Table 9.

Electronic billing enhances precision of accuracy of tax deductions made from employees' PAYE system.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	2.2	2.2	2.2
	Disagree	13	14.0	14.0	16.1
	Undecided	16	17.2	17.2	33.3
	Agree	32	34.4	34.4	67.7
	strongly agree	30	32.3	32.3	100.0
	Total	93	100.0	100.0	

Source: Field Survey, 2025

Table 9. illustrates the responses regarding the usage of electronic billing to enhance precision of accuracy of Tax Deductions made from employees' salaries based on PAYE system. Out of the total respondents, 2 individuals (2.2 percent) expressed a strong disagreement with the statement, while 13 respondents (14.0 percent) simply disagreed. There were 16 respondents (17.2 percent) who remained undecided on the matter. On the other hand, a significant number of respondents showed positive views. Specifically, 32 participants (34.4 percent) agreed with the statement, and 30 respondents (32.3 percent) strongly agreed with it. The cumulative

agreement from these respondents indicates that electronic billing enhances precision of accuracy of tax deductions made from employees' salaries based on PAYE system.

Table 10.

Electronic billing system enhance direct assessment through determining a taxpayer's liability based on their income, assets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	7	7.5	7.5	7.5
	Disagree	8	8.6	8.6	16.1
	Undecided	18	19.4	19.4	35.5
	Agree	32	34.4	34.4	69.9
	strongly agree	28	30.1	30.1	100.0
	Total	93	100.0	100.0	

Source: Field Survey, 2025.

Table 10. illustrates the responses regarding the usage of electronic billing system to enhance direct assessment through determining a taxpayer's liability based on their income, assets. Out of the total respondents, 7 individuals (7.5 percent) expressed a strong disagreement with the statement, while 8 respondents (8.6 percent) simply disagreed. There were 18 respondents (19.4 percent) who remained undecided on the matter. On the other hand, a significant number of respondents showed positive views. Specifically, 32 participants (34.4 percent) agreed with the statement, and 28 respondents (30.1 percent) strongly agreed with it. The cumulative agreement from these respondents indicates that the electronic billing system enhance direct assessment through determining a taxpayer's liability based on their income, assets.

Table 11.

The implementation of automated data entry has made tax compliance and direct assessment more convenient and efficient.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	6.5	6.5	6.5
	Disagree	9	9.7	9.7	16.1
	Undecided	17	18.3	18.3	34.4
	Agree	29	31.2	31.2	65.6
	strongly agree	32	34.4	34.4	100.0
	Total	93	100.0	100.0	

Source: Field Survey, 2025

Table 11. illustrates the responses regarding the implementation of automated data entry which has made tax compliance and direct assessment more convenient and efficient. Out of the total respondents, 6 individuals (6.5 percent) expressed a strong disagreement with the statement, while 9 respondents (9.7 percent) simply disagreed. There were 17 respondents (18.3 percent) who remained undecided on the matter. On the other hand, a significant number of

respondents showed positive views. Specifically, 29 participants (31.2 percent) agreed with the statement, and an even larger group of 32 respondents (34.4 percent) strongly agreed with it. The cumulative agreement from these respondents indicates that the implementation of automated data entry has made tax compliance and direct assessment more convenient and efficient.

Table 12.

Automated data entry has streamlined the tax assessment process which now takes shorter time by tax authorities to complete the direct assessment filing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	5.4	5.4	5.4
	Disagree	10	10.8	10.8	16.1
	Undecided	18	19.4	19.4	35.5
	Agree	26	28.0	28.0	63.4
	strongly agree	34	36.6	36.6	100.0
	Total	93	100.0	100.0	

Source: Field Survey, 2025.

Table 12. illustrates the responses regarding automated data entry whichhas streamlined the tax assessment process which now takes shorter time by tax authorities to complete the direct assessment filing. Out of the total respondents, 5 individuals (5.4 percent) expressed a strong disagreement with the statement, while 10 respondents (10.8 percent) simply disagreed. There were 18 respondents (19.4 percent) who remained undecided on the matter. On the other hand, a significant number of respondents showed positive views. Specifically, 26 participants (28.0 percent) agreed with the statement, and an even larger group of 34 respondents (36.6 percent) strongly agreed with it. The cumulative agreement from these respondents indicates that the automated data entry has streamlined the tax assessment process which now takes shorter time by tax authorities to complete the direct assessment filing.

Table 13.

Online filling services suggest higher enrollment of direct assessment rate by tax payer.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	7	7.5	7.5	7.5
	Disagree	9	9.7	9.7	17.2
	Undecided	10	10.8	10.8	28.0
	Agree	35	37.6	37.6	65.6
	strongly agree	32	34.4	34.4	100.0
	Total	93	100.0	100.0	

Source: Field Survey, 2025

Table 13. illustrates the responses regarding the online filling services suggest higher enrollment of direct assessment rate by tax payer. Out of the total respondents, 7 individuals (7.5 percent) expressed a strong disagreement with the statement, while 9 respondents (9.7 percent) simply disagreed. There were 10 respondents (10.8 percent) who remained undecided on the matter. On the other hand, a significant number of respondents showed positive views. Specifically, 35 participants (37.6 percent) agreed with the statement, 32 respondents (34.4 percent) strongly agreed with it. The cumulative agreement from these respondents indicates that online filling services suggest higher enrollment of direct assessment rate by tax payer.

4.2 Data Analysis

Table 14.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.968[a]	.937	.933	.341

a. Predictors: (Constant), PAYE, DIAS.

In Table 14. it is evident that the R-square value of 0.937 signifies that the independent variables collectively contribute to 93.7% of the variation in the dependent variable. Similarly, the adjusted R-square value of 0.933 accurately demonstrates that the combined impact of pay as you earn, and direct assessment accounts for 93% of the influence on digital tax administration.

Table 15.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	149.019	5	29.804	256.738	.000[b]
	Residual	10.100	87	.116		
	Total	159.118	92			

a. Dependent Variable: DTA

b. Predictors: (Constant),PAYE, DIAS.

According to the data presented in Table 15. the F-statistics value is 256.738, and the corresponding significance level is .000. These values indicate that the model is highly significant at the 5% level, confirming its appropriateness and fitness. As a result, the outcomes are reliable and provide a solid basis for making informed decisions.

Table 16.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.346	.102		3.377	.001
	PAYE	.226	.092	.229	2.465	.016
	DIAS	.361	.087	.374	4.173	.000

a. Dependent Variable: DTA

Discussion of Findings

The findings presented in Table 4.2.3 highlight the relationship between various factors and digital tax administration. Firstly, the analysis reveals that digital tax administration has a significant and positive impact on pay as you earn (PAYE) tax. The t-statistic of 2.465 with a corresponding significance level of 0.016 indicates that digital tax administration plays a crucial role on the amount generated on pay as you earn. The rejection of null hypothesis one further supports this positive association. This result agrees with the studies of :Mamidu (2022) who examined the relationship between Nigeria States' internally generated revenue (IGR) and pay-as-you-earn tax (PAYE) among Nigeria State governments and found out that there was no short run but long run relationship between pay-as-you-earn tax (PAET) and internally generated revenue (IGR) among Nigeria States; Binglar and Oyadonghan (2019) ascertain the effect the cost of Tax Administration on Revenue Generation with specific focus on selected taxpayers under the Pay-As-You-Earn (PAYE) system in Bayelsa State; finds out that there is a significant relationship between Cost of administration and Revenue Generation in Bayelsa State; Adedeji and Akindele (2018) examined the contribution of personal income tax to revenue generation in Ondo State from 2006 to 2015; showed that PAYE significantly and positively correlated with internal revenue generation; Fasina, Adegbite and Alabi (2018)

evaluated the effect of personal income tax on internally generated revenue (IGR) of government in Ekiti State; indicated that PAYE had positive and significant effect on Revenue generation of government in Ekiti state and Tyoakosu and Awuhe (2017) examined the income profile of Benue State Government and assessed the impact of personal income tax on the internally generated revenue accruable to the state; found that pay-as-you-earn has significant positive contribution to internally generated revenue in Benue state

Furthermore, the analysis indicates that digital tax administration has a positive and significant effect on direct assessment tax. The beta coefficient value of 0.374 and a p-value of 0.000 (less than the critical value of 0.05) support this finding. The t-statistic of 4.173 leads to the rejection of the null hypothesis, showing that implementation of digital tax administration predicts a corresponding increase in the amount generated via direct assessment. This finding agrees with the findings of Olurankinse and Oladeji (2018) who examines self-assessment, e-taxation payment systems and revenue generation in Nigeria. and the results indicates a positive and significant relationship between self-assessment and e-taxation payment systems and Revenue generation; Fasina, Adegbite and Alabi (2018) evaluated the effect of personal income tax on internally generated revenue (IGR) of government in Ekiti State; findings indicated that direct assessment had positive significant effect on Revenue generation; Adedeji and Akindele (2018) examined the contribution of personal income tax to revenue generation in Ondo State from 2006 to 2015; result of the correlation analysis showed that direct assessment (DA) positively correlated with internal revenue and Appah and Ogbonna (2014) that examine self assessment scheme and revenue generation in Nigeria; analysis reveals that self assessment compliance rate significantly affects revenue generation in Nigeria. the study disagreed with the studies of Eseneyen and Ewa (2020) who determine the impact of the self-assessment system of taxation on tax revenue in Nigeria and concluded that Self-Assessment System of taxation has a negative but insignificant effect on tax revenue in Nigeria, also Tyoakosu and Awuhe (2017) examined the income profile of Benue State Government and assessed the impact of personal income tax on the internally generated revenue accruable to the state; found that direct assessment has insignificant negative contribution to internally generated revenue in the state over the study period.

Conclusion and Recommendations

Based on the empirical results of the hypotheses tested, the study therefore concludes that digital tax administration has positively and significantly affected tax revenue generation in the North central state of Nigeria and this has resulted into more revenue generation to

government, improved social and capital development and invariably an enhanced gross domestic product. The paper therefore recommends that North central states of Nigeria should improve on digitalization of their services and procedures, explore potential areas that could be digitalized to curb tax evasion and avoidance, educate and sensitize tax payers that are yet to adhere to these digitalized processes due to illiteracy or fear of data theft and endeavor to make all digitalized processes and procedures to be taxpayer's friendly.

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Audit Committee Characteristics and Accounting Conservatism of Listed Deposit Money Banks in Nigeria

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ABSTRACT

The study investigated the audit committee characteristics and accounting conservatism of listed deposit money banks in Nigeria. Utilizing an ex-post facto research design, the population comprised nine (9) deposit money banks listed on the Nigerian Exchange Group as of December 31, 2023. Due to the small population size and data availability, all nine the banks were included in the sample based on census sampling. Data spanning eleven years (2013-2023) were collected from the annual reports and accounts of the sampled banks. The study used a robust random effect regression model. The study found that audit committee gender diversity has an insignificant negative effect on accounting conservatism, audit committee independence has an insignificant positive effect on accounting conservatism and audit committee financial expertise has a significant and positive effect on accounting conservatism of listed deposit money banks in Nigeria. The study recommended that deposit money banks should increase the number of women on their audit committees, aiming to reduce conservative accounting practices. Also, deposit money banks should prioritize reducing the number of non-executive director members on the audit committees to 50% to synergize and effectively oversee financial reporting processes, enforce stringent financial controls, and mitigate aggressive accounting practices.

Keywords: Audit Committee Characteristics; Audit Committee Financial Expertise; Audit Committee Gender Diversity; Audit Committee Independence; Accounting Conservatism.

INTRODUCTION

The global focus on audit committee characteristics and their correlation with accounting conservatism has become a prominent subject in academic circles and corporate governance discourse. Audit committees are pivotal components within a company's board of directors, tasked with overseeing financial reporting processes, ensuring transparency, and improving the quality of financial information disclosed (Martin *et al.*, 2022). The responsibilities of an audit committee encompass a wide range of duties, including reviewing audits, monitoring accounting policies, overseeing external auditors, ensuring regulatory compliance, and engaging in discussions about risk management with management teams (Aliyu & Ismail, 2022). To optimize their effectiveness, audit committees must have well-defined responsibilities,

access to auditors without management presence, ongoing communication with auditors, informal dialogue with management between meetings, and direct access to relevant departments (Dabor & Dabor, 2013).

Committee composition is a critical aspect, necessitating financial literacy among members and a diverse set of skills, competencies, and industry knowledge to effectively fulfill their oversight functions (Dabor & Dabor, 2013; Bhardwaj & Rao, 2015). Regular evaluations of the committee's performance and adherence to best practices are vital for maintaining high standards of financial reporting and compliance (Bhardwaj & Rao, 2015). Audit committee characteristics such as gender diversity, independence, and financial expertise play integral roles in upholding transparency, accountability, and trust within corporate governance frameworks. These characteristics are essential for ensuring effective oversight, robust risk management practices, and reliable financial reporting within organizations. Audit committee gender diversity refers to the inclusion of a variety of genders among committee members. It has been linked to improved corporate productivity and performance (Kabiru & Usman, 2021; Green & Homroy, 2018). Gender diversity enhances decision-making processes and information flow within audit committees. Audit committee independence entails members being free from any conflicts of interest, ensuring unbiased oversight. (Fama & Jensen, 1983). Independent audit committees are crucial for maintaining integrity and trust in financial reporting (Abbott *et al.*, 2004). The Cadbury committee (1992) advocated for independent audit committees to increase accountability and safeguard shareholders' interests. Audit committee financial expertise involves members possessing knowledge and experience in finance and accounting. Financially literate committee members can better assess complex financial matters and enhance strategic decision-making within organizations (Joseph *et al.*, 2011; Ping *et al.*, 2011).

Accounting conservatism remains a fundamental principle in financial reporting, emphasizing prudence by reporting assets and revenues at minimum values and liabilities and costs at maximum values. Basu (2019) highlights conservatism's role in promptly recognizing losses over gains, showcasing a company's readiness to disclose unfavorable information quickly. Bliss (2019) defines conservatism as an approach that expects no profits but anticipates all losses, while Givoly and Hayn (2020) characterize it as a criterion guiding slower revenue recognition, faster expense acknowledgment, lower asset valuation, and higher liability assessment, ultimately leading to understated earnings. These perspectives collectively

underscore conservatism's significance in financial reporting, prioritizing caution and reliability in presenting a company's financial health.

Audit committee characteristics play a crucial role in shaping accounting conservatism within listed deposit money banks in Nigeria. Audit committee gender diversity brings diverse perspectives and decision-making approaches, potentially influencing the conservative nature of financial reporting. Research suggests that gender-diverse committees may exhibit a more cautious approach to recognizing gains and losses, thus impacting accounting conservatism (Kabiru & Usman, 2021). Audit committee independence ensures unbiased oversight, promoting conservative practices in financial reporting by prioritizing prudence and accurate disclosure of risks and uncertainties (Abbott *et al.*, 2004). Audit committee financial expertise contributes to a better understanding of financial complexities, leading to informed judgments on conservative accounting practices such as revenue recognition and asset valuation. This expertise enhances the reliability and credibility of financial statements, aligning with conservative reporting principles (Joseph *et al.*, 2011).

Audit committee gender diversity, independence, and financial expertise collectively impact the adoption of conservative accounting practices, ensuring transparency, accuracy, and risk management in financial reporting. The motivation behind this study stems from the need to understand how specific audit committee characteristics influence accounting conservatism within the unique context of Nigerian deposit money banks. By examining these relationships, the study aims to provide valuable insights into governance practices that can enhance financial reporting reliability and promote investor confidence in the Nigerian banking sector. Therefore, this study seeks to examine the impact of audit committee characteristics on accounting conservatism of listed deposit money banks in Nigeria.

In the Nigerian banking sector, particularly among deposit money banks, significant challenges have arisen concerning audit committee characteristics and their impact on accounting conservatism. A primary issue faced by audit committees in Nigerian banks is the inadequate representation of gender diversity within these committees. Studies indicate that gender-diverse committees tend to adopt more cautious and conservative approaches to financial reporting (Kabiru & Usman, 2021). However, the underrepresentation of women in audit committees within Nigerian banks poses a potential obstacle to the adoption of conservative accounting practices, which could lead to less prudent reporting. Another critical concern is the

independence of audit committees. A lack of independence can compromise the objectivity and effectiveness of audit committees in overseeing financial reporting processes. When committees lack independence, they may fail to challenge management's judgments and decisions, thus affecting the conservatism of financial reporting (Abbott *et al.*, 2004).

Additionally, the level of financial expertise among audit committee members presents a practical problem. Insufficient financial knowledge and expertise can limit the committee's ability to make informed judgments regarding conservative accounting practices such as revenue recognition and asset valuation. This deficiency in expertise may result in less accurate and reliable financial reporting, undermining the principles of accounting conservatism (Joseph *et al.*, 2011). Gender-diverse audit committees in Nigerian banks tend to adopt conservative accounting practices, promoting prudent financial reporting and risk management. Addressing gender diversity gaps is crucial for enhancing accounting conservatism. Additionally, independent audit committees play a vital role in maintaining conservatism by providing unbiased oversight and challenging management decisions. Strengthening independence within these committees is essential. Furthermore, the financial expertise of committee members influences conservatism, highlighting the need to enhance financial knowledge within audit committees for reliable financial reporting in Nigerian banks.

The existing literature on audit committee characteristics and accounting conservatism lacks specific focus on Nigerian deposit money banks. While studies have explored similar relationships in geographical contexts such as Egypt, Thailand, Indonesia, and Iran, the unique regulatory, governance, and economic landscape of Nigerian banks remains unaddressed. Furthermore, prior studies have not extensively incorporated variables such as gender diversity, independence, and financial expertise within the audit committees of Nigerian banks. This study aims to bridge these gaps by employing the Generalized Least Squares (GLS) regression model to analyze the impact of audit committee characteristics on accounting conservatism over a ten-year period (2013-2023) within Nigerian deposit money banks. The research will also consider evolving regulatory frameworks, market dynamics, and stakeholder expectations, providing crucial insights for stakeholders and policymakers in the Nigerian banking sector.

Objectives of the Study

The main objective of this study is to examine audit committee characteristics and accounting conservatism of listed deposit money banks in Nigeria while the specific objectives are to:

i. assess the impact of audit committee gender diversity on accounting conservatism of listed deposit money banks in Nigeria.
ii. determine the impact of audit committee independence on accounting conservatism of listed deposit money banks in Nigeria.
iii. evaluate the impact of audit committee financial expertise on accounting conservatism of listed deposit money banks in Nigeria.

Hypotheses of the study

Base on the specific objectives of the study, the following hypotheses are formulated in null form to guide the study:

Ho_1: Audit committee gender diversity has no significant impact on accounting conservatism of listed deposit money banks in Nigeria.

Ho_2: Audit committee independence has no significant impact on accounting conservatism of listed deposit money banks in Nigeria.

Ho_3: Audit committee financial expertise has no significant impact on accounting conservatism of listed deposit money banks in Nigeria.

LITERATURE REVIEW

Conceptual Review

Concept of Audit Committee Characteristics

An audit committee refers to a board of directors' committee responsible for overseeing the financial reporting process, selecting independent auditors, and reviewing both internal and external audit findings (Dare *et al.*, 2021). Ahmed (2018) defines the audit committee as a group of board members ensuring auditors' independence, while Bala (2014) highlights its composition of non-executive directors. These definitions collectively emphasize the audit committee's primary objective: enhancing audit quality to improve financial reporting. The committee, a pivotal operational arm of a company's board, oversees financial disclosures, internal controls, risk management, and audit functions (Bansal & Sharma, 2016; Dabor & Dabor, 2013). According to the Companies and Allied Matters Act (CAMA) of 1990 as amended 2020, the audit committee acts as a liaison between external auditors and the board of directors, as well as between management and auditors.

This role is pivotal in ensuring transparency and effective corporate governance (Modum *et al.*, 2013). Shamsudden (2003) stresses the importance of integrity and expertise among

committee members, while Bhardwaj & Rao (2015) assert that a robust audit committee contributes to strategic decision-making and financial performance improvement. The concept of audit committees varies based on their objectives, functions, and responsibilities. Al-Thuneibat (2006) defines them as committees comprising non-executive directors, aiming to enhance auditing quality and reduce directors' scrutiny during audits. Similarly, Arens *et al.* (2009) underscore the committee's role in safeguarding auditors' independence. In the Nigerian context, the Nigerian Exchange (NGX) Group's governance rules of 2011 specify the composition and duties of audit committees for listed companies. These committees must comprise non-executive board members, with at least two being independent and one chairing the committee. They should possess financial and accounting knowledge, establish written procedures approved by the board, and have the authority to seek external opinions. The audit committee's oversight role is critical for organizational financial performance, as it monitors principal officers' activities (Nigerian Exchange (NGX) Group, 2011).

The significance of audit committees lies in their ability to enhance financial reporting quality, governance transparency, and strategic decision-making within organizations. The audit committee's characteristics, such as gender diversity, independence, and financial expertise, play vital roles in fulfilling these responsibilities. Gender diversity in audit committees ensures a broad range of perspectives and insights, enhancing decision-making processes (Higgs, 2003). Independent audit committees mitigate conflicts of interest and promote unbiased oversight (Carcello & Neal, 2000). Financially literate committee members are better equipped to understand and assess complex financial matters, contributing to effective governance (Cohen *et al.*, 2002).

Despite these benefits, the study acknowledges certain limitations. Its focus on deposit money banks within Nigeria's financial sector restricts the generalizability of findings to other industry segments. Moreover, the study's exclusive emphasis on audit committee characteristics may overlook broader factors influencing accounting conservatism, such as regulatory changes or macroeconomic conditions. In conclusion, audit committees are integral to corporate governance and financial reporting quality. Their composition, independence, and expertise significantly impact organizational transparency and performance.

Audit Committee Gender Diversity

Gender diversity reflects the societal disparity, making it a desirable aspect of corporate governance for social cohesion and enhanced corporate value (Gallego-Álvarez *et al.*, 2010).

Female directorship is often associated with a higher level of commitment and effort toward their roles, leading to improved information flow and decision-making within the boardroom (Pathan & Faff, 2013). Diversity within audit committees, as advocated in corporate governance literature, extends beyond gender to include a mix of executives, independent and non-executive directors, diverse experiences, expertise, and skills (Campbell & Minguez-Vera, 2010; Rhode & Peckel, 2010). While gender diversity is gaining strategic importance, with institutional investors considering it a critical criterion for investment policies (Kabiru & Usman, 2021), it is essential to recognize other dimensions of diversity often overlooked, such as social and racial diversity. Rhode and Packel (2010) suggest that well-managed diversity on boards enhances firm value, improves decision-making processes, and contributes to a positive corporate image of equality.

Milliken and Martins (1996) categorize diversity into observable attributes like gender, age, race, and ethnic background, as well as non-observable attributes such as personal values, personality characteristics, and education. Audit committee gender diversity can contribute to financial benefits for firms, aligning with shareholder value considerations (Dang *et al.*, 2012). Women directors are often noted for their cautious approach, which can translate into better risk management and investment decisions, ultimately safeguarding firm investments and assets. Increased awareness about gender equality and the rising number of educated women have contributed to the growing presence of women on boards. This trend is supported by strong evidence indicating the positive impact of audit committee gender diversity on performance (ElHawary, 2021; Kabiru & Usman, 2021; Kasthury & Anandasayanan, 2020). Robinson and Dechant (1997) highlight that demographic diversity among corporate boards can lead to improved decision-making processes, thereby positively influencing firm value. In essence, gender diversity within audit committees and corporate boards is crucial for enhancing decision-making effectiveness, risk management, and overall firm performance. The increasing recognition of the performance impact of gender diversity underscores its strategic importance in corporate governance and investment decision-making.

Audit Committee Independence

Independence has long been considered a critical attribute of audit committees, as highlighted by Fama and Jensen (1983) in their agency theory. They argued that the composition of non-executive directors is crucial for the effectiveness of the audit committee's monitoring function. Similarly, the Blue-Ribbon Committee (BRC) emphasized the importance of composition for the

audit committee to fulfill its oversight role effectively. Numerous studies, such as those by Marrakchi *et al.* (2001) and Bradbury *et al.* (2006), have found a relationship between audit committee composition, supervision levels, and fraud in financial statements, often using the percentage of outside directors as a measure of composition. Keasey *et al.* (1993) demonstrated that the composition of audit committee members is a critical criterion affecting the reliability of financial statements. Additionally, Bryan and Al (2004) discovered a positive influence of audit committee composition on earnings quality. Conversely, Abbott *et al.* (2004) suggested that independent audit committees are less likely to be associated with financial statement fraud but are associated with fewer earning restatements due to their ability to provide unbiased assessment and effective management monitoring (Agrawal & Chadha, 2005).

The Cadbury committee (1992) recommended the establishment of oversight committees, including audit committees, based on agency theory principles. These committees were seen as additional control mechanisms that increase accountability and ensure shareholders' interests are safeguarded. The Cadbury committee report (1992) specifically recommended staffing audit committees with non-executive directors for their independent viewpoints on critical decisions, ensuring decisions align with shareholders' best interests (Weir & Laing, 2001). A well-functioning audit committee practicing good accounting can enhance organizational effectiveness (Joseph *et al.*, 2011). Auditor independence is crucial for the integrity of the audit process and adds value to audited financial statements (Ping *et al.*, 2011). Helen and Arnold (2011) stressed the importance of audit committee strength in impacting audit processes and internal controls. Jeffrey *et al.* (2011) also highlighted the significance of audit committee independence in ensuring the integrity of the financial reporting process, as it helps prevent management from manipulating accounts for their self-interests, ensuring fairness in financial reporting.

Audit Committee Financial Expertise

Audit committee expertise in financial matters is crucial for effective control and oversight. DeZoort (2018) emphasizes that the experience of audit committee members in accounting and auditing is essential for them to adequately understand their oversight tasks, including internal control evaluation. It has been observed that audit committee members with relevant experience are better equipped to make expert judgments regarding internal control compared to those without experience. The functions of an audit committee necessitate the inclusion of a

finance expert as a member, as suggested by the Sarbanes-Oxley Act (SOX) of 2002. SOX recommended to the US Securities and Exchange Commission (SEC) that audit committees of public firms should be required to have at least one member who is a financial expert. SOX defined financial expertise narrowly to include individuals with accounting or auditing experience. Therefore, an audit committee member must possess knowledge, understanding, or experience in accounting or finance and must stay informed about events affecting changes in the financial reporting process. This requirement aims to enhance the efficiency and performance of the audit committee, as its primary duty is to review the financial reporting process and ensure high-quality outcomes.

There is a general consensus that suitable experience and knowledge, particularly in accounting and auditing, can improve the performance and judgment of an audit committee. To fulfill their oversight responsibility for internal control and financial reporting, audit committees must possess the necessary expertise, particularly in accounting and financial predictions, according to recent studies by Yang *et al.* (2019) and Carcello *et al.* (2020). Choi *et al.* (2018) categorized audit committee expertise into five categories: financial expertise, accountancy, expertise of university professors or former professionals, expertise of employees, and expertise in law. For example, recent research by De Fond (2020) demonstrates that market participants react positively to the appointment of audit committees with financial expertise in accounting, whereas no such reaction was observed for audit committees with non-accounting financial expertise. This can be attributed to the fact that committee members with accounting financial expertise enhance the oversight function of audit committees and provide credible signals to investors, thereby increasing the accounting conservatism. Similarly, DeFond *et al.* (2019) suggested that the positive market reaction is concentrated among firms with relatively strong corporate governance practices.

Concept of Accounting Conservatism

Accounting conservatism is a principle in financial reporting that promotes prudence and caution in the recognition and measurement of assets, liabilities, revenues, and expenses. It involves a bias towards recognizing losses and liabilities earlier than gains and assets. This approach serves as a valuable means of reducing the agency problem, which arises due to the separation of ownership and control in corporations. By restraining opportunistic behavior and reducing information asymmetry between management and external stakeholders, accounting conservatism enhances the reliability of financial statements and protects the interests of

shareholders and creditors. Watts (2019) argues that accounting conservatism plays a crucial role in curbing managerial opportunism. It reduces the ability of management to overstate the firm's net assets and earnings, thereby discouraging manipulative practices that could mislead investors and creditors. By recognizing losses earlier, accounting conservatism ensures that negative events and risks are promptly reflected in financial statements, providing a more accurate portrayal of the firm's financial position.

One way in which accounting conservatism deters management from engaging in opportunistic behavior is by influencing investment decisions. Ball and Shivakumar (2006) suggest that accounting conservatism discourages managers from investing in projects with negative net present value. Since conservatism limits the ability to defer loss recognition to the future, managers are compelled to carefully evaluate the economic viability of potential investments. This prevents the pursuit of projects that may artificially boost short-term performance but have adverse long-term implications for the firm's financial health. Watts (2019) emphasizes the importance of differential verifiability in accounting conservatism. Recognizing losses is generally more verifiable than recognizing gains, as it often involves observable events such as the impairment of assets or the failure of customers to meet their obligations. Hille (2011) further argues that accounting conservatism introduces an asymmetry in substantiating overstated losses and overstated gains. This differential treatment of gains and losses creates a conservative bias that safeguards against the overstatement of financial performance. Moreover, Ma *et al.* (2020) highlight that the application of accounting conservatism influences how gains and losses are perceived by stakeholders. When gains have a higher degree of verifiability and are more likely to be reported conservatively, they are viewed as good news in corporate reporting. This helps to mitigate the risk of management manipulating financial results by overstating gains while downplaying losses.

Theoretical Review

Agency Theory

The agency theory, first proposed by Jensen and Meckling in 1976, addresses the challenges arising from the separation of ownership and control in corporations. This theory highlights the conflicts of interest and differing objectives between principals (shareholders/owners) and agents (managers) responsible for running the company. The core of the agency problem lies in several key assumptions. Principals aim to maximize their wealth, while agents may have

distinct goals such as maximizing their personal utility or ensuring job security (Eisenhardt, 1989). This divergence in goals can lead to conflicts, as agents might prioritize their interests over those of the principals. Furthermore, information asymmetry exists, with agents typically possessing superior knowledge about the company's operations and financial performance (Fama, 1980). This informational advantage can be exploited by agents for personal gain, potentially harming the principals. Additionally, agents are assumed to act in their self-interest, engaging in behaviors that may not align with the best interests of the principals (Eisenhardt, 1989). They may take risks or neglect their responsibilities, knowing that the consequences would primarily affect the principals. These assumptions underscore the inherent challenges and conflicts inherent in the agency problem.

Despite criticisms, the agency problem has significant strengths. It emphasizes the importance of aligning the interests of principals and agents for effective firm management (Jensen & Meckling, 1976). Addressing conflicts of interest has led to the development of governance mechanisms like monitoring systems, incentive structures, and external audits (Fama & Jensen, 1983). These mechanisms aim to mitigate agency conflicts, foster accountability, transparency, and enhance corporate governance practices. Moreover, the agency problem provides a theoretical framework for analyzing and understanding corporate governance challenges. It has shaped academic research on principal-agent relationships and governance mechanism design (Eisenhardt, 1989).

However, the agency problem has faced criticisms. Some argue that it oversimplifies human behavior by assuming agents are solely motivated by self-interest, neglecting other factors influencing managers (Donaldson, 1990). Treating agents as a homogenous group overlooks the diversity of goals and interests among managers within a company. Additionally, empirical evidence directly linking the agency problem to firm performance or financial outcomes is limited, raising doubts about its impact's causality and magnitude (Daily & Dalton, 1992). Critics also note the agency problem's focus on conflicts between principals and agents, neglecting the interests of other stakeholders like employees, customers, and society (Donaldson & Preston, 1995). This criticism emphasizes the need for broader consideration of stakeholder interests in corporate governance discussions.

Agency theory provides a framework for understanding the relationship between shareholders (principals) and the audit committee (agents) of deposit money banks in Nigeria. The theory suggests that conflicts of interest may arise between these parties due to information

asymmetry and differing incentives. By examining audit committee characteristics such as independence, gender diversity, and financial expertise, the study can assess how these factors influence the agency relationship. For instance, a more independent and diverse audit committee may be better equipped to represent shareholder interests and mitigate agency costs, potentially leading to more conservative accounting practices that align with shareholder preferences and reduce the likelihood of opportunistic behavior by management.

Theory Relevant to the Study

This study is underpinned by agency theory as it posits that conflicts of interest can arise between shareholders (principals) and the audit committee (agents) due to information asymmetry and differing incentives. In the context of the study, audit committee characteristics such as independence, gender diversity, and financial expertise can significantly influence how these conflicts are managed. A more independent and diverse audit committee is likely to act in the best interests of shareholders, promoting accountability, transparency, and prudent decision-making. This can lead to the adoption of accounting conservatism practices aimed at reducing agency costs and mitigating opportunistic behavior by management. By applying agency theory, the study can explore how these audit committee attributes influence the agency relationship and ultimately impact the accounting conservatism of listed deposit money banks in Nigeria over the specified decade.

Empirical Review

Egbadju (2024) investigated the impact of some corporate governance attributes on accounting conservatism in Nigeria. The study covers the period from 2005 to 2020 of 75 non-financial firms listed on the floor of the Nigerian Exchange Group (NXG). The study conducted a generalized method of moments (GMM) regression analysis. The study revealed that board size (BODS), managerial ownership (MOWN), audit committee size (ACS) and number of foreign directors (NFODIR) are positively significant with accounting conservatism; chief executive officer with military experience (CEOME) and board independence (BODI) are negatively significant with it but board gender diversity (BGDIV) is insignificant. Again, while the Big4 as well as the number of foreign directors (NFODIR) are positively significant; foreign income (FINCOME) as well as the industry (IDUM) and yearly (YDUM) dummy variables are positively insignificant. The study recommended that management should maintain or increase the present level of board size, managerial ownership, audit committee size and the number of

foreigners in the board since these variables allowed management to stick to prudence in financial reporting for the period under review.

Arogundade and Ajibade (2023) investigated the effect of corporate governance (represented by gender composition of the board, composition of audit committee and risk management committee) on accounting conservatism (represented by asymmetric timeliness measure and market to book ratio) of quoted firms in Nigeria. Ex-post facto research design was used. The population of this study comprised 17 food and beverage firms listed on the Nigerian Exchange Group (NGX) as at December 31st, 2021 from which 14 were selected by Purposive sampling technique. The study period was 10 years (2012 to 2021). Data were obtained from the published audited financial statements. The study used descriptive and inferential statistics for data analysis. The study revealed that corporate governance jointly had no significant effect on asymmetric timeliness measure and market to book ratio. This study recommended that policy makers should pay close attention to corporate governance policies and measures such as the gender composition of the board, composition of audit committee and risk management committee in order to enhance accounting conservatism and bring about accounting conservatism and by extension improve the quality of financial statements.

Adie (2022) examined the effect of the audit committee characteristics and financial reporting quality in listed deposit money banks in Nigeria. The study covers a period of twelve years from 2010-2021. The dependent variable was determined using a two steps regression in order to determine the loan loss provision. The pooled OLS model is used to run the multiple regression analysis. The study found that the significance of the audit committee characteristics and financial reporting quality shows a strong statistical significance. The study recommends that there should be an increase in the number of financial expertise and independent members.

Aliyu and Ismail (2022) evaluated the effect of the audit committee on financial reporting quality in Nigeria. The study utilized data from 41 non-financial firms listed in the Nigerian Stock Exchange (NSE) for the 2011 to 2019 period. The study employed the Generalized Method of Moments (GMM) technique which is robust to endogeneity and heteroskedasticity threat. The study indicated that audit committee size, shareholders and financial experts' inclusion in audit committee convey a significantly negative relationship with earnings management, thereby reducing discretionary accruals and increase financial reporting quality. The study recommended that the board of directors should ensure appointment of sufficient audit committee members with adequate financial expertise in which shareholder should be included.

Almaleeh (2022) examined the association between audit committee characteristics (expertise, independence, size, and activity) and accounting conservatism in the Egyptian setting. Data is collected from the annual reports and board of director's reports of the companies included in the sample which is composed of 11 companies that belong to five main sectors: real estate, basic resources, IT, media and communication, non-bank financial services, and textile and durables sector. These companies are listed in the Egyptian Stock Exchange (EGX) during the period from 2015 to 2019. Two regression models were developed to test the research hypotheses. The study showed that audit committee expertise is positively associated with the degree of accounting conservatism in the Egyptian listed firms' financial statements, while this association is not proven for audit committee independence, size, or activity. The study offers no recommendations.

Arthitaya *et al.* (2022) studied the relationship between audit committee characteristics and accounting conservatism of listed companies in the stock exchange of Thailand. The data were collected by financial reports and annual reports of listed companies in the stock exchange of Thailand. The study conducted a multiple regression analysis. The study found that accounting and financial knowledge of audit committee was significantly positively related to accounting conservatism, the tenure of audit committee members was significantly negatively related to accounting conservatism and that the size of the audit committee and the frequency of the audit committee's meetings wasn't related to accounting conservatism. The study recommended that the supervisory board of listed companies and the stakeholders should pay more attention to the characteristics of accounting and financial knowledge and the tenure of audit committee members.

Mentari (2021) examined the effect of characteristics of the board of commissioners and audit committee on the level of accounting conservatism. The study used multiple regression method. The data used is secondary data from the company's annual report. The population of this study is a manufacturing company listed on the Indonesia Stock Exchange in 2009-2011 while the sample used is 33 companies. The study found that the characteristics of the board of commissioners had no significant effect on accounting conservatism, while indicators of the audit committee such as the size of the audit committee, the frequency of committee meetings, and the competence of the audit committee had a significant effect on accounting conservatism. The study has no recommendations.

Namakavarani *et al.* (2021) explored the relationship between audit committee characteristics and accounting information quality by justifying the role of the internal information environment and political connections under the theocracy state of Iran with syncretic politics. The study used panel data of 558 firms from the Tehran Stock Exchange (TSE) for 2011–2016. The study showed that there is a significant and positive relationship between the audit committee and financial information quality characteristics in high-level political connections, as well as between financial knowledge and financial information quality. The study offers no recommendations.

Shiyanbola *et al.* (2019) investigated the effects of corporate governance on conservatism of quoted financial and non-financial firms in Nigeria. The study adopted ex-post facto research design using the population of 161 listed companies on Nigerian Stock Exchange at 31st December, 2017. Sample of 30 quoted financial and non-financial firms was purposively selected from 2003-2017. Multiple regression analyses was used. The study revealed that corporate governance had joint significant effects on conservatism of quoted financial and non-financial firms in Nigeria. The study recommended that management should comply with code of corporate governance so as to reflect on their financial practices and that government should monitor organizational compliance.

Javad and Javad (2018) investigated the association between gender diversity on audit committees and the incidence of financial restatements. The study covered a sample of 683 firm-year observations from Iranian listed companies for the period from 2013 to 2017 and conducted a logistic regression model. The study found that the presence of at least one female director on audit committees reduces the likelihood of the incidence of financial restatements and also found that independent and financial expert female directors on audit committees are more strongly associated with a reduction in financial restatements. The study offers no recommendations.

Onyabe *et al.* (2018) examined the effect of audit committee independence and size on financial reporting quality of listed deposit money banks (DMB) in Nigeria. Cross sectional data was obtained from the Nigerian Stock Exchange fact books and the financial statements of fifteen (15) listed deposit money banks over a period of ten years (2007-2016). The data was analyzed using STATA 13. The study reveals that audit committee independence has a negative but significant effect on financial reporting quality of listed deposit money banks in Nigeria. Also, audit committee size has no significant effect on the financial reporting quality of

listed deposit money banks in Nigeria. The study recommended that deposit money banks in Nigeria should ensure that their boards are independent as this is likely to enhance financial reporting quality and management of deposit money banks in Nigeria should consider the provisions of the Nigerian code of corporate governance in audit committee composition.

Gap in Literature

Based on the empirical review provided, there are several gaps regarding the impact of audit committee characteristics on accounting conservatism, particularly within the context of the Nigerian banking sector. While studies such as Almaleeh (2022), Arthitaya *et al.* (2022), Mentari (2021), and Namakavarani *et al.* (2021) have explored similar topics in different geographical contexts like Egypt, Thailand, Indonesia, and Iran, respectively, there is a notable absence of research specifically tailored to the Nigerian banking environment. Furthermore, prior studies have not extensively incorporated variables such as gender diversity, independence, and financial expertise within the audit committees of Nigerian banks. This study aims to bridge these gaps by employing the generalized least squares (GLS) regression model to analyze the relationship between audit committee characteristics (gender diversity, independence, financial expertise) and accounting conservatism over ten years period (2013-2023) within Nigerian deposit money banks.

METHODOLOGY

This study used an *ex-post facto* research design to evaluate how audit committee characteristics impact accounting conservatism in listed Nigerian deposit money banks. The population of this study consists of all the nine (9) deposit money banks listed on the Nigerian Exchange (NGX) Group as at 31st Dec. 2023. The study selected all nine deposit money banks based on census sampling technique due to the small population size and data availability. This study used secondary sources of data. The data were extracted from the annual reports and accounts of nine (9) deposit money banks listed on the Nigerian Exchange (NGX) Group for the period 2013 to 2023. The data were analyzed using Robust Random Regression techniques was considered appropriate for this study.

Model Specification

The study used accounting conservatism as dependent variable which is regressed against the explanatory variables that comprise audit committee gender diversity, audit committee

independence and audit committee financial expertise. The regression model is presented as follows;

$ACCSM_{it} = \beta_0 + \beta_1 ACGD_{it} + \beta_2 ACIND_{it} + \beta_3 ACFE_{it} + \varepsilon_{it}$

Where:
ACCSM = Accounting conservatism
ACGD = Audit committee gender diversity
ACIND = Audit committee independence
ACFE = Audit committee financial expertise
ε = Error term
β_0 = intercept
i = period
t = time
β_1, β_2, and β_3 = the various slope coefficients of the explanatory variables.

Variables Measurement and Justification

The measurement of the variables are presented in table 1

Table 1: Measurement of the Variables

Variable Name	Type	Variable Measurement and Justification
Accounting conservatism (ACCSM)	Dependent	Measured as the market-to-book ratio (Almaleeh, 2022; Arogundade & Ajibade, 2023; Arthitaya *et al.*, 2022).
Audit committee gender diversity (ACGD)	Independent	Measured as the percentage of female members on the audit committee (Arogundade & Ajibade, 2023; Egbadju, 2024; Javad & Javad, 2018).
Audit committee independence (ACIND)	Independent	Measured as the percentage of non-executive members on the total number of audit committee (Almaleeh, 2022; Arthitaya *et al.*, 2022; Onyabe *et al.*, 2018)
Audit committee financial expertise (ACFE)	Independent	Measured as the ratio of audit members with accounting and finance knowledge (Aliyu & Ismail, 2022; Almaleeh, 2022; Arthitaya *et al.*, 2022)

Source: Researcher's Compilation (2024).

Data Presentation and Analysis

The data of the nine (9) deposit money banks regarding accounting conservatism (ACCSM), and audit committee characteristics proxied by audit committee gender diversity (ACGD), audit committee independence (ACIND) and audit committee financial expertise (ACFE) were used. The data were analysed with the aid of Stata 13 software using Descriptive Statistics, Shapiro Wilk Normality Test, Pearson Correlation Matrix, Variance Inflation Factor, Heteroscedasticity test, Hausman Specification test, Breusch-Pagan Lagrangian Multiplier test and Robust Random Effect Regression Model based on the data.

Descriptive Statistics

Table 2: Summary of Descriptive Statistics of the Variables

Variables	Obs	Mean	Std. Dev.	Min	Max

ACCSM	97	1.774249	1.503247	.1255	6.715
ACGD	97	.0906495	.1475878	0	.429
ACIND	97	.3619691	.1817296	.143	.667
ACFE	97	.3020619	.0931502	.13	.6

Source: Researcher's Computation using STATA 13 software

Table 2 shows that the accounting conservatism (ACCSM) has a minimum value of .1255, a maximum value of 6.715 and a mean value of 1.774249 that is within the minimum and maximum values indicating a good spread within the period studied. The table also reveals that ACCSM has a standard deviation of 1.503247 that is less than the mean, which implies that it had a slow growth for the period under review. Table 2 shows that audit committee gender diversity (ACGD) has a minimum value of 0, a maximum value of .429 and a mean value of .0906495 that is within the minimum and maximum values indicating a good spread within the period studied. The table also reveals that ACGD has a standard deviation of .1475878 that is more than the mean, which implies that it had a strong growth for the period under review.

Table 2 also shows that audit committee independence (ACIND) has a minimum value of .143, a maximum value of .667 and a mean value of .3619691 that is within the minimum and maximum indicating a good spread within the period studied. The table also reveals that ACIND has a standard deviation of .1817296 that is less than the mean, which implies that it had slow growth during the period under review. Table 2 shows that the audit committee financial expertise (ACFE) has a minimum value of .13, a maximum value of .6 and a mean value of .3020619 that is within the minimum and maximum values indicating a good spread within the period studied. The table also reveals that ACFE has a standard deviation of .0931502 that is less than the mean, which implies that it had a strong growth for the period under review.

Shapiro Wilk Normality Test

Table 3: Results of the Normality Test Conducted with the Use of Shapiro Wilk Test

Variables	Obs	W	V	Z	Prob>z
Residual	97	0.95121	3.927	3.029	0.00122

Source: Researcher's Computation using STATA 13 software

Figure 1: Normal Distribution Curve

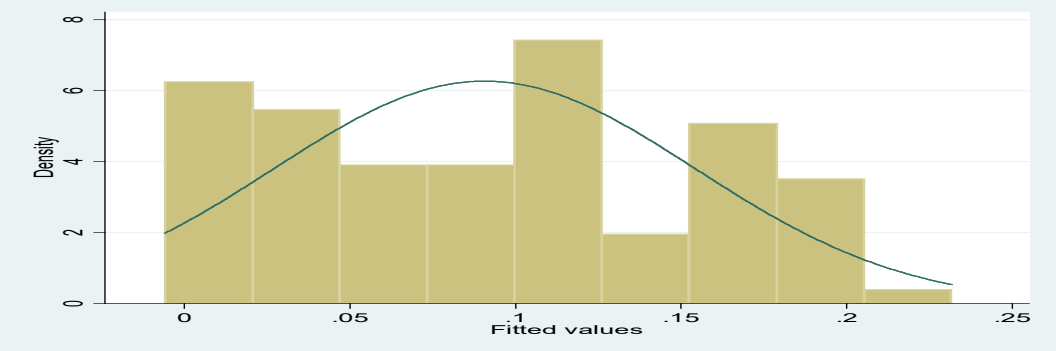

Table 3 above shows the residual and the z value of 3.029 and the corresponding probability of value of 0.00122 that is less than 0.05 which signifies that the residual is not normally distributed around the mean. This result is further collaborated by the normal distribution curve presented in figure 1 above. This implies that one of the basic assumptions of generalized least square regression technique which allows only normally distributed residual has been violated which necessitated the use of robust regression technique.

Pearson Correlation

Table 4: Pearson Correlation Matrix for the Data Set.

	ACCSM	ACGD	ACIND	ACFE
ACCSM	1.0000			
ACGD	0.1696	1.0000		
ACIND	0.3834	-0.0696	1.0000	
ACFE	0.1306	0.0726	0.3200	1.0000

Source: Researcher's Computation using STATA 13 software

The correlation matrix determines the degree of relationships between the proxies of an independent variable and the dependent variable. It is also used to show whether there is an association among the proxies of independent variable themselves, to detect if a multicollinearity problem exists in the model. The result from table 4 shows that there exist approximately 17% positive and weak relationship between audit committee gender diversity (ACGD) and accounting conservatism (ACCSM) of deposit money banks in Nigeria from the correlation coefficient of 0.1696. The table also shows that there is a 38% positive and moderate relationship between audit committee independence (ACIND) and accounting conservatism (ACCSM) of deposit money banks in Nigeria from the correlation coefficient of 0.3834. Furthermore, the table shows 13% positive and weak relationships between Audit committee financial expertise (ACFE) and accounting conservatism (ACCSM) of deposit money banks in Nigeria from the correlation coefficient of 0.1306. Finally, the relationships between

proxies of independent variable themselves suggest being mild as all coefficients are below the threshold of 0.80 as suggested by (Gujarati, 2003).

Variance Inflator Factor (VIF) Results

Table 5: Variance Inflator Factor (VIF)

Variable	VIF	I/VIF
ACFE	1.13	0.888545
ACGD	1.12	0.888925
ACIND	1.02	0.985112
Mean VIF	1.09	

Source: Researcher's Computation using STATA 13 software

To further confirm the absence of multicolinearity problem among the exogenous variables, colinearity diagnostics test was equally observed as the Variance Inflation Factors (VIF) and the Inverse Variance Inflation Factors (I/VIF) values portray no multicolinearity problem in the data as their values are less than 10 and 1 respectively (Gujarati, 2003) as presented in table 5. This point to the fact that the variables are well selected and fitted in the same regression model because the multicolinearity problem is absent in the model, which is one of the requirements for regression technique.

Heteroscedasticity test

Table 6: Heteroscedasticity test

Type of test	Chi2	P-Value
Heteroscedasticity Test	26.90	0.0000

Source: Researcher's Computation Using STATA 13 software

To establish that the data for this study was robust for the model, a Heteroscedasticity test was carried out. The study revealed that the data is heteroskedastic. This is confirmed from the heteroskedasticity result in table 6 which revealed the chi2 value of 26.90 with a p-value of 0.0000. This failed to satisfy the classical linear regression assumption of homoskedasticity (Constant error variance) which necessitated the use of robust regression technique.

Breusch-Pagan Lagrangian Multiplier Test

Table 7: Result of the Breusch-Pagan Lagrangian Multiplier test conducted.

Variable	Chibar2	P-Value
ACCSM	389.87	0.0000

Source: Researcher's Computation using STATA 13 software

The Breusch-Pagan Lagrangian Multiplier test was conducted to give an insight into an actual test to be carried out between Random Effect Model and Pooled Ordinary Least Square Regression. From the Breusch-Pagan Lagrangian Multiplier test, the chibar2 value of (389.87)

and the probability of (0.0000) in table 7 above, therefore, suggests that Random Effect Model is more appropriate instead of Pooled Ordinary Least Square Regression.

Hausman Specification Test

Table 8: Result of Hausman Specification Test Conducted

Chi2	**0.15**
Prob. Chi2	0.9295

Source: Researcher's Computation using STATA 13 software

The data for this study is panel and panel data can lead to an error that is clustered and possibly correlated over time. This is because each deposit money banks may have its entity-specific characteristic that can determine its characteristics (i.e. unobserved heterogeneity). And this may bias the outcome variable or even the explanatory variables. As such, there is a need to control for that, the Hausman test was conducted and shows that the random effect model is more appropriate. This can be confirmed from the Chi2 value of 0.15 with a p-value of 0.9295 in table 8 which is not significant at all levels of significant.

The Results of Robust Random Effect Regression Model

Table 9: Robust Random Effect Regression Model Conducted

Variable	**Coefficients**	**z-value**	**Prob.**
ACGD	-.0862664	-0.76	0.449
ACIND	2.061796	1.44	0.150
ACFE	2.508177	2.58	0.010
_Cons	2.540819	7.06	0.000
R-sq Overall	0.5297		
Wald Chi2	126.26		
Prob. >chi1	0.0000		

Source: Researcher's Computation using STATA 13 software

Table 9 above shows approximately 53% variation of accounting conservatism (ACCSM) is predicted by the combined effect of audit committee gender diversity (ACGD), audit committee independence (ACIND) and audit committee financial expertise (ACFE) with (Overall R-sq of 0.5297). This indicates that the model of the study is fit and the independent variables are properly combined and used. The Wald chi2 value of 26.26 with a P-value of 0.0000 signified that the model is fit for the study.

Test of Hypotheses

To examine the audit committee characteristics and accounting conservatism of listed deposit money banks in Nigeria, the formulated hypotheses were tested using a robust random effect regression model.

Ho_1: Audit committee gender diversity has no significant impact on accounting conservatism of listed deposit money banks in Nigeria.

From the regression result in table 9, audit committee gender diversity has a negative z-value and a p-value of -0.76 and 0.449 respectively, this shows that audit committee gender diversity is negative and insignificant at 5% level of significance. Based on this, the null hypothesis which says that audit committee gender diversity has no significant effect on accounting conservatism of listed deposit money banks in Nigeria is accepted.

Ho_2: Audit committee independence has no significant impact on accounting conservatism of listed deposit money banks in Nigeria.

The z-value for audit committee independence of 1.44 shows that there is a positive relationship between audit committee independence and accounting conservatism while the p-value of 0.150 further indicates that the relationship is insignificant at all level of significance, implying that audit committee independence positively but insignificantly influences the accounting conservatism of listed deposit money banks in Nigeria. Thus, the study accepts the null hypothesis which states that audit committee independence has no significant effect on accounting conservatism of listed deposit money banks in Nigeria.

Ho_3: Audit committee financial expertise has no significant impact on accounting conservatism of listed deposit money banks in Nigeria.

The results in Table 9 above shows that the z-value of 2.58 and the corresponding p-value of 0.010 shows that audit committee financial expertise has a significant positive effect on accounting conservatism of listed deposit money banks in Nigeria for the period under review. Based on this, the null hypothesis which says that audit committee financial expertise has no significant effect on accounting conservatism of listed deposit money banks in Nigeria is rejected.

Discussion of Findings

Audit Committee Gender Diversity and Accounting Conservatism

The study reveals that audit committee gender diversity (ACGD) has an insignificant negative effect on accounting conservatism of listed deposit money banks in Nigeria. This shows that

increase in audit committee gender diversity will decrease the accounting conservatism of listed deposit money banks in Nigeria, by -.0862664. This contrasts with agency theory, which suggests diversity enhances decision-making and oversight, potentially leading to more conservative accounting practices. This finding is not in agreement with the finding of Adie (2022).

Audit Committee Independence and Accounting Conservatism

The study also reveals that audit committee independence (ACIND) has an insignificant positive effect on accounting conservatism of listed deposit money banks in Nigeria. This shows that increase in audit committee independence will increase the accounting conservatism of listed deposit money banks in Nigeria, by 2.061796. While this aligns with agency theory's emphasis on independence enhancing oversight and accountability, the insignificance implies other factors may also be influencing conservatism. This finding is in consonance with the findings of Arogundade and Ajibade (2023) and not in agreement with the findings of Adie (2022), Javad and Javad (2018) and Onyabe *et al.* (2018).

Audit Committee Financial Expertise and Accounting Conservatism

The study finally reveals that audit committee financial expertise (ACFE) has a significant and positive effect on accounting conservatism of listed deposit money banks in Nigeria. This shows that increase in audit committee financial expertise will increase the accounting conservatism of listed deposit money banks in Nigeria, by 2.508177. This supports agency theory as financial expertise enhances the audit committee's ability to enforce rigorous financial reporting and adopt conservative accounting practices, thus reducing information asymmetry and aligning management actions with shareholders' interests. This finding is in consonance with the findings of Adie (2022), Aliyu and Ismail (2022), and Arthitaya *et al.* (2022).

Conclusion and Recommendations

Audit committee gender diversity negatively affects accounting conservatism, suggesting that higher gender diversity within audit committees may lead to less conservative accounting practices. This may be due to diverse perspectives prioritizing different aspects of financial reporting, potentially reducing the emphasis on conservative accounting. Conversely, audit committee independence positively influences accounting conservatism implying that increased independence among audit committee members enhances their oversight capabilities, leading to more conservative accounting practices. This aligns with agency theory, which posits that

independent audit committees can better mitigate conflicts of interest and enforce stringent financial controls.

Based on the conclusion of this study, the following recommendations are offered:

i. Deposit money banks should increase the number of women on their audit committees, aiming to maintain conservative accounting practices. Women on audit committees may bring varied perspectives and prioritize different aspects of financial reporting, potentially reducing excessive conservatism.

ii. Also, deposit money banks should prioritize reducing the number of non-executive director members on the audit committees to 50% to synergize and effectively oversee financial reporting processes, enforce stringent financial controls, and mitigate aggressive accounting practices.

iii. Deposit money banks should ensure that audit committee members possess substantial financial expertise as financial experts within the audit committee can understand complex financial issues and enforce rigorous accounting standards.

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CORPORATE BOARD ATTRIBUTES AND PERFORMANCE OF BIG 4 AUDIT FIRMS IN NIGERIA

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ABSTRACT

The study examined the effect of corporate board attributes on the performance of the Big 4 audit firms in Nigeria from 2013 to 2022. The research adopted an ex-post facto design. The population comprised the Big 4 auditing/ accounting firms. Secondary data was used and was collected from the published financial statements of these Big 4 audit firms. This study adopted Ordinary Least Squares regression analysis to analyze the effects of corporate board attributes on the performance of the big 4 audit firms in Nigeria. Findings revealed that board composition and board independence have significant effects on the performance of the Big 4 audit firms in Nigeria. Hence, we recommend that regular assessment of board composition and board independence is necessary for their continual effectiveness in improving the performance of the Big 4 audit firms in Nigeria.

Keywords: Corporate Board Attributes, Board Composition, Board Independence, Performance, Big 4 Audit Firms, Nigeria.

INTRODUCTION

In recent years, corporate governance has grown crucial to the performance and sustainability of businesses globally. Corporate boards hold a significant role in this area. Individuals are increasingly recognizing that factors such as board size, independence, gender diversity, meeting frequency, and financial acumen significantly influence a company's performance. In Nigeria, where the corporate sector is still developing, these board characteristics are receiving more scrutiny due to their impact on transparency, accountability, and audit quality.

Deloitte, PricewaterhouseCoopers (PwC), Ernst & Young (EY), and KPMG are regarded as the premier audit firms. These firms are the principal auditors for large and publicly listed corporations in Nigeria. Individuals believe that their dimensions, assets, and global standing

will result in superior audit services. Recent study indicates that the quality of audits conducted by these firms may be influenced by the internal governance frameworks of their client organizations, particularly characteristics associated with the board. Research indicates that board size, independence, and audit committee composition significantly affect the selection and effectiveness of audit firms, including the Big 4 auditors (Sanyaolu & Animasau, 2021). Similarly, a robust and diverse board may seek enhanced audits, thereby influencing the performance of Big 4 firms and their accountability (Oladejo et al., 2021). The attributes of corporate boards are relevant not only to internal governance but also to the operational dynamics and effectiveness of external auditors. Given the notorious audit failures globally and in Nigeria, including those of companies with ostensibly clean audit reports, it is crucial to examine how board qualities influence the performance of even the most reputable audit firms. This is particularly significant in Nigeria, where regulations are continually evolving and various organizations and sectors employ diverse methodologies.

Even though the Big 4 audit firms are the most powerful in Nigeria and are thought to be the best at what they do, there are rising worries about how well they actually do their jobs and how independent they are. A plethora of research indicate that board characteristics inside client organizations can directly affect audit quality, especially in instances when boards exhibit a deficiency in independence or diversity (Tanko & Polycarp, 2019). Nonetheless, there exists a paucity of empirical information particularly examining the impact of these board features on the actual performance of Big 4 auditors within the Nigerian environment. One of the main problems is that boards that are politically connected or made up of insiders may make it hard for auditors to be independent or pressure them to write good reports (Abdulmalik et al., 2016). Another difficulty is that while audit committee independence has been associated to greater firm performance, it is uncertain whether it enhances the impartiality and rigor of Big 4 audits (Udoh et al., 2023). Furthermore, whereas the majority of current research focuses on the impact of board characteristics on corporate financial performance, there is a scarcity of studies investigating the bidirectional influence specifically, how these characteristics both affect and are affected by the audit results produced by Big 4 auditors. For instance, a company with a weak board or no financial experts may not be able to properly oversee or question audit results, which would make even the best auditors less effective (Ilaboya & Obaretin, 2015). Recent studies indicate that board diversity and experience substantially influence business performance and reporting quality, implying that analogous effects may also pertain to audit performance (Onuorah & Friday, 2014). Nonetheless, the precise mechanisms by which board

characteristics affect Big 4 audit results such as audit precision, frequency of restatements, or auditor transitions are inadequately examined in the Nigerian context.

Objectives of the Study

The main objective of this study is to determine the effect of corporate board attributes on the performance of the big 4 audit firms in Nigeria. The specific objectives are stated as follows:

1) To analyze the effect of board composition on the performance of the big 4 audit firms in Nigeria.
2) To examine the effect of board independence on the performance of the big 4 audit firms in Nigeria.

Research Hypotheses

The underlying hypotheses that guide this study are stated below in their null forms:

H_{01}: There is no significant effect of board composition on the performance of big 4 audit firms in Nigeria.

H_{02}: There is no significant effect of board independence on the performance of big 4 audit firms in Nigeria.

REVIEW OF RELATED LITERATURE

Conceptual Review

Corporate Board Attributes

Corporate board attributes are the characteristics of board of directors of companies that influence its composition, functionality, and overall performance in governance. The attributes include board size, independence, diversity, expertise, and the roles and responsibilities of board members (Owonifari, Ajoloko and Adewara 2023). In this study, corporate board attributes are measured using board composition and board independence.

Board Composition

Board composition refers to the combination of executive directors (including the chief executive officer) and non-executive directors on the board. Sometimes, non-executive directors are appointed from outside and they may not have any material interest in the firm also known as independent directors. (Fields and Keys, 2013).

Board Independence

Board independence refers to the avoidance of being unduly influenced by a vested interest and to being free from any constraints that would prevent a correct course of action from being taken by the members of the board of directors. (Carcello, 2017).

Firm Performance

Firm performance can be defined and measured in terms of profitability, growth, market value, total return on shareholder, economic value added, and customer satisfaction, based on the stakeholder's expectations (Carroll, 2017). According to Burja (2015) firm performance from the perspective of macroeconomics, is the direct outcome of managing economic assets and ensuring their effective use in operational, investment and monetary ventures.

Return on Assets

Return On Assets (ROA) is a ratio that shows how much an asset plays in creating a net profit (Hery, 2015). The greater the ROA ratio the better the company's asset management's efficiency and effectiveness, the better.

Theoretical Review

The study is based on the Resource Dependency Theory (RDT)

Pfeffer and Salancik (1978) developed the resource dependence theory to explain how organisations' behaviour is affected by the resources they possess. Pfeffer and Salancik focused more on the role of the board of directors in providing access to resources needed by the firm Resource dependency theorists focused on the appointment of representatives of organizations as a means for gaining access to resources critical to firm success. Directors bring resources to the firm, such as information, skills, and access to key constituents such as suppliers, buyers, public policymakers, and social groups as well as legitimacy (Hillman et al. 2000). The RDT recognizes that the survival of organizations is dependent on directors'/managers reasoned and intentional allocation of resources to innovative activities required of the firm by customers and investors. Thus, how managers compete and win resources (internal and external) and deploy such resources to productive engagements have impacts on their exchange-based power and control and thus significant consequences on the continuity of funding sources and survival and growth of the entity (Jiang, et al, 2022).

Empirical Review

Amahalu (2020) investigates the effect of board diversity on the financial performance of quoted natural resources firms in Nigeria from 2008 – 2017. An ex-post facto research design was used for this study. Secondary data were sourced from the publications of the Nigeria Stock Exchange. Inferential statistics of the hypotheses were carried out with the aid of E-view 9.0 statistical software using Co-efficient of correlation and Multivariate Panel Least Square Regression analysis. The findings showed that Board Diversity has a significant positive effect

on Return on Assets and Tobin's Q; and a significant negative effect on Returns on Equity at a 5% level of significance respectively

Alanazi (2019) examined the link of corporate governance with the performance of the corporate in 90 companies listed in the Tadawul stock market in Saudi Arabia from 2005 - 2010. The study remarked on the low governance in developing economies as compared to developed economies and there has been no such difference in operations between good and poor governance firms.

Nwaiwu and Joseph (2018) investigated the relationship between core corporate governance and the financial performance of quoted manufacturing companies in Nigeria from 2012-2016. The results indicate that audit committee members have a significant effect on profitability measured as earnings per share and return on assets, and concludes that the Board needs to comprise well-educated people since they are actively involved in shaping the company's strategy.

Uwalomwa, Eluyela Uwuigbe, Obarakpo and Falola (2018) explored corporate governance on the timeliness of financial reports of listed banks in Nigeria using descriptive statistics, correlation matrix and panel data regression to analyse the data. The study generated data from the annual reports of the listed banks on the Nigerian stock exchange for the period (2008-2015). The study found that board size had a non-significant negative link with the timeliness of financial reports.

Vig and Dutta (2018) investigated if the excellence in context of "Corporate governance" impacts the value creation of firms for which 25 firms were considered as samples for the years 2009-10 to 2013-14 and analysis was done through panel regression model and Granger Causality test. The study underlined the insignificant and no causal association between corporate governance and value creation.

Amahalu et al (2017) examine the effect of corporate governance on firms' borrowing costs from 2010 to 2015. Corporate governance was measured using three indicators: Board size, ownership concentration and Board independence. They find that Board size, ownership concentration and Board independence have a positive and significant effect on borrowing costs by decreasing the firm's cost of capital.

To analyse the connection between business performance and governance features such as board leadership structure, Duru et al. (2016) used a generalized method of moments (GMM) to generate a dynamic model. ExecuComp, ISS (previously Risk Metrics), and Compustat datasets were combined to create a sample of 17,282 firm-year observations that covered the

years 1997–2011. The study found that having two CEOs had a significant negative impact on a company's overall performance when compared to a single CEO.

A study on board characteristics and firm performance was carried out in Egypt by Amer (2016). The research approach adopted in the research covered GLS random effect regression over the nine years covering 2004 to 2012 with respect to the 50 most active listed companies on the Egyptian stock exchange. The study revealed that that there is a positive relationship between the proportion of independent directors on the board and the firm financial performance as measured by Return on Equity (ROE), CEO duality also showed a significant positive relationship with ROE, and the director ownership was also found to be positively associated with firm performance as measured by ROE, but the relation was not significant.

Arora and Sharma (2016) analyzed data from 1922 firms from the year 2001 to 2010 to determine how corporate governance is associated with the performance of the firm in the Indian manufacturing industry. There has been negative or no association found between CG variables and performance for which it has been argued that it is due to non-compliance of guidelines of CG by the firms.

Ben, Patrick and Caleb (2015) conducted a study on 24 Nigerian banks for the years 2006 to 2013 to explore whether corporate governance impacts the performance of deposit money banks (DMBs) through questionnaires filled by shareholders and annual reports of the banks. There has been no evidence found to indicate statistically significant difference between corporate governance practices among the DMBs according to the perception of the shareholders. Moreover, corporate governance proxy variables and DMBs' performance have been found significantly related both positively and negatively.

Vo and Nguyen (2014) illustrated how the corporate governance practices of 177 listed firms in Vietnam affects firm's performance from 2008 to 2012 through the feasible least squares technique. It found that CEO Duality and Ownership concentration relate positively with the performance of the company while Board independence is found to be related adversely to the performance of firms and board size has no bearing on a firm's performance.

Shungu, Ngirande and Ndlovu (2014) in their study explored the bearing of Corporate Governance on the extent of how much five commercial banks of Zimbabwe performed. It has been revealed that bank performance is affected by corporate governance indicated by positive association with board composition and board diversity and negative association with board size and board committees.

METHODOLOGY

The study adopted an *ex post* facto research design. The population comprised the Big 4 audit firms in Nigeria: PricewaterhouseCoopers (PwC); Ernst & Young (EY); Klynveld Peat Marwick Goerdeler (KPMG); and Deloitte. Total population count was used. Data were collected from the published financial statements of these Big 4 audit firms for the period of 2013-2022. This study adopted Ordinary Least Squares regression analysis to analyze the effects of corporate board attributes on the performance of big 4 auditing firms in Nigeria.

Model Specification

The model adopted for the analysis is presented as follows:

FP = f (BC, BI, control) ---------- (eqn1)

Where:

FP is the firm performance, which is proxied by return on assets (ROA)

BC is board composition and

BI is the board's independence.

Controls are the control variables, which include firm size (FS) and Leverage (L)

DATA PRESENTATION AND ANALYSIS

The data used for the analyses were from the annual reports and accounts of the big 4 firms

Data Analysis

Table 1: Results of the Descriptive Statistics

	ROA	BC	BI	FS	L
Mean	0.064578	0.902944	0.718193	2.906957	6.054500
Median	0.067656	1.180254	0.833943	1.567365	5.859167
Maximum	0.077194	1.427206	1.351967	7.664379	10.12083
Minimum	0.044784	0.000000	0.000000	0.296007	2.473333
Std. Dev.	0.010341	0.635070	0.534209	2.982488	1.971018
Skewness	-0.933900	-0.757522	-0.435560	0.569703	0.412583
Kurtosis	2.702442	1.715312	1.671409	1.720017	3.720384
Jarque-Bera	1.490506	1.644076	1.051668	1.223584	0.499938
Probability	0.474614	0.439535	0.591062	0.542378	0.778825
Sum	0.645783	9.029437	7.181929	29.06957	60.54500
Sum Sq. Dev.	0.000962	3.629820	2.568411	80.05710	34.96422

Source: Computed by the Researchers' (2024),

Descriptive statistics measures the basic summary of the characteristics of the variables using the measures of central tendencies such as mean, median, standard deviation, Skewness and Kurtosis. From the estimated results of the descriptive statistics above, it could be deduced that the mean value, median, standard deviation, Skewness and Kurtosis did not drift too much from each other. Also, the mean variations in the series move from -23.74670 to 10.12083

which represents the least and highest values in the series of the variables. In addition, the probability values of most of the variables concerning Jaque-Bera statistics are less than 0.05 implying that the errors of the variables are normally distributed and suitable for the estimation of the corporate board attributes, and performance of big audit firms in Nigeria.

Test of Hypothesis

Hypothesis 1: There is no significant effect of board composition on the performance of big audit firms in Nigeria.

Regression Result of Hypothesis 1 (ROA, BC, FS, L)

Dependent Variable: ROA
Method: Least Squares
Date: 01/31/24 Time: 09:26
Sample (adjusted): 2014 2022
Included observations: 9 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	1.014802	0.177699	5.710798	0.0000
BC	-0.007428	0.000946	-7.852008	0.0000
FS	-0.000851	0.001895	-0.449292	0.6720
L	0.000862	0.001737	0.496335	0.6407

R-squared	0.799234	Mean dependent var	0.064105
Adjusted R-squared	0.518775	S.D. dependent var	0.010853
S.E. of regression	0.015033	Akaike info criterion	-5.255979
Sum squared resid	0.001130	Schwarz criterion	-5.168324
Log likelihood	27.65190	Hannan-Quinn criter.	-5.445139
Durbin-Watson stat	2.149356		

Source: Researchers' computation (2024)

Decision: However, from the results, we discovered that the probability value of board composition is less than 0.05 across all the models and we therefore reject the null hypothesis and accept the alternative hypothesis and then conclude that there is a significant effect of board composition on the performance of big 4 audit firms in Nigeria (P = 0.0000).

Hypothesis 2: There is no significant effect of board independence on the performance of big audit firms in Nigeria.

Regression Result of Hypothesis 1 (ROA, BI, FS, L)

Dependent Variable: ROA
Method: Least Squares
Date: 01/31/24 Time: 09:29
Sample (adjusted): 2014 2022
Included observations: 9 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	1.025100	0.181631	5.643873	0.0000
BI	-0.087409	0.010437	-8.374916	0.0000
FS	-0.000757	0.001840	-0.411590	0.6977
L	0.000449	0.001408	0.318801	0.7628

R-squared	0.809729	Mean dependent var	0.064105
Adjusted R-squared	0.635567	S.D. dependent var	0.010853
S.E. of regression	0.015099	Akaike info criterion	-5.247266
Sum squared resid	0.001140	Schwarz criterion	-5.159610
Log likelihood	27.61270	Hannan-Quinn criter.	-5.436426
Durbin-Watson stat	2.248183		

Source: Computed by the researchers

Decision: Having discovered that the probability value of board independence is less than 0.05 across all the models, we reject the null hypothesis and accept the alternative hypothesis and therefore conclude that there is a significant effect of board independence on the performance of big 4 audit firms in Nigeria (P =0.0000).

Discussion of Findings

From the results of the OLS, we found that corporate board attributes has significant effects on the performance of the big 4 accounting firms in Nigeria. Our findings therefore are in line with Amahalu (2020), Duru et al. (2016), Amer (2016), Shungu, Ngirande & Ndlovu (2014), who respectively found that Board Diversity has a significant positive effect on Return on Assets; having two CEOs had a significant negative impact on a company's overall performance when compared to a single CEO; and a positive relationship between the proportion of independent directors on the board and the firm financial performance. The outcome of this study contradicts the findings of Arora & Sharma (2016), Ben, Patrick & Caleb (2015), Vo & Nguyen (2014), who respectively found a negative & no association found between CG variables & performance; no statistically significant difference between corporate governance practices & DMB performance; and Board independence is found to be negatively associated with performance of firms.

CONCLUSION AND RECOMMENDATIONS

Having found a significant effect of board composition and board independence on the performance of the big 4 audit firms in Nigeria, implying that both improve the performance of the firms studied, the researchers therefore conclude that corporate board attributes have an

effect on the performance of the Big 4 audit firms in Nigeria. The researchers recommend that the Big 4 audit firms, as the leading audit firms both in Nigeria and the diaspora, should continually maintain this standard by not deviating from the corporate governance rules. As their performance will always be assured with the right combination of executive directors and non-executive directors on the board, appointed based on their qualifications, expertise and experience, and who are independent. Moreover, regular assessment of board composition and board independence is necessary for their continual effectiveness in improving the performance of the Big 4 audit firms in Nigeria.

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Costing Methods and Financial Performance of Industrial Goods Manufacturing Companies in Nigeria

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ABSTRACT

This study investigated the relationship between costing methods and financial performance of industrial goods manufacturing companies in Nigeria, with its specific objectives to determine the relationship between the dimensions of costing methods (marginal costing and absorption costing) and the measures of financial performance (net profit margin). The population of the study consisted of 100 respondents from the 10 out of 14 industrial goods manufacturing companies in Nigeria which were selected using the probability techniques. Primary data were collected from respondents using the questionnaire instrument. Linear Regression was used with the aid of Statistical Package for Social Sciences version 23.0 to test the null hypotheses. The findings of the study revealed that marginal costing had a positive moderate relationship with net profit margin (r = 0.489) and absorption costing had a positive strong relationship with net profit margin (0.639). All the proxies' linear regression analyses had p-value of 0.000 which is very significant; meaning that the marginal costing and absorption costing had very significant relationship with net profit margin. The findings indicated that costing methods had positive relationship with financial performance. The study therefore recommended that the Firms should adopt marginal costing to leverage its benefits in flexible pricing strategies. Firms should improve inventory management practices to avoid overproduction and excessive inventory holding costs, which can negatively impact financial performance under absorption costing

Keywords: Costing Methods, Financial Performance, Marginal Costing, Absorption costing, Net profit margin, Industrial Goods Manufacturing Companies, Nigeria.

Introduction

The Nigerian industrial goods manufacturing sector is a key driver of economic development, fostering significant contributions to GDP and job creation. However, navigating increasing competition, fluctuating input costs, and evolving consumer preferences poses significant challenges. Costing methods emerge as a crucial tool to address these challenges effectively. By influencing pricing decisions, cost control measures, and ultimately a firm's financial health, costing methods empower manufacturers to make strategic choices.

Costing methods go beyond influencing just price and profit. A well-chosen method can also provide valuable insights into the efficiency of a firm's various processes. A reliable costing method offers a more representative picture of how overhead costs are actually incurred for each good or service (Thesis & Huton, 2017). As highlighted by Turovski et al. (2023), discrepancies between applied and actual overhead costs can help managers pinpoint inefficiencies within processes or identify products with cost-related issues. This research should encompass understanding the suitability of each method for different scenarios and how they allocate overhead costs. Managers can then evaluate this information against their firm's current labor resources, data collection capabilities, and overall business strategy. Factors like producing a high-quality product at a competitive price should be considered when selecting a method.

This revised introduction maintains the core content while improving readability and flow. It emphasizes the importance of costing methods in the Nigerian manufacturing sector and highlights the factors firms should consider when choosing a costing method. The selection of costing methods significantly impacts the financial performance of manufacturing firms. In Nigeria, this challenge is compounded by the inconsistent application of costing practices and a volatile economic climate. This study investigates the relationship between specific costing methods and the financial health of listed industrial goods manufacturers in Nigeria.

Profitability remains a major concern for Nigerian industrial goods companies due to difficulties in implementing effective cost management strategies. Maximizing profit requires careful attention to cost control and reduction methods. However, inadequate management practices can lead to the adoption of inappropriate strategies, ultimately resulting in wasted resources. Furthermore, the lack of readily available cost information hinders accurate decision-making in the face of economic uncertainty and risk.

Literature Review and Hypotheses

Theoretical Underpinnings

Agency Theory

Agency Theory, introduced by Jensen and Meckling (1976), explores the relationship between principals (owners or shareholders) and agents (managers) in a firm. This theory addresses issues that arise due to differing goals and information asymmetry between these two parties. In the context of industrial goods manufacturing firms in Nigeria, Agency Theory provides a framework for understanding how costing methods can influence financial performance through the actions and decisions of managers.

The application of Agency Theory in the context of costing methods and financial performance highlights the importance of aligning managerial actions with shareholder interests through accurate and transparent cost allocation practices. By reducing information asymmetry, aligning incentives, and improving monitoring, advanced costing methods such as Activity-Based Costing (ABC) and Time-Driven Activity-Based Costing (TDABC) can significantly enhance the financial performance of industrial goods manufacturing firms in Nigeria. This alignment fosters a more efficient, accountable, and profitable organization, benefiting both principals and agents.

Concept of Costing Methods

Costing method refers to the system or procedure used to ascertain the costs of producing goods or providing services in a business. There are several different costing methods, including job costing, process costing, activity-based costing (ABC), and standard costing. Each method has its own benefits and limitations and is used in different industries based on their specific requirements.

One commonly used costing method is job costing, which is used in industries like construction, consulting, and custom manufacturing. In job costing, the costs are identified and accumulated for each specific job or project. This method allows businesses to determine the profitability of individual jobs and allocate costs accordingly.

Another costing method is process costing, which is used in industries where large quantities of identical products are produced, such as chemical manufacturing or food processing. Process costing accumulates costs for each process or department and allocates them to units of output. This method helps businesses determine the cost per unit and evaluate the efficiency of different processes (Atkinson, Kaplan, Matsumura & Young, 2019).

Marginal Costing

Marginal costing, a fundamental concept in managerial accounting, has garnered significant attention in recent years due to its pivotal role in business decision-making (Wheldon, 2023). It is defined as the change in total costs resulting from a change in the volume of production and sales (Joseph, 2023; Tamplin, 2023).

Marginal costing also known as variable costing, is a method of costing that involves calculating the marginal cost of a product or service, which is the change in total cost that arises when the quantity produced or sold is increased by one unit. This method is used to determine the cost of a product or service for the purpose of managerial decision-making.

Marginal costing is a costing technique that focuses on analyzing the contribution margin of each product or service. Contribution margin is calculated by deducting variable costs from sales revenue. In marginal costing, fixed costs are treated as period costs that are not allocated to specific products but are deducted as a lump sum from the total contribution margin. This approach helps businesses determine the profitability of each product or service and make decisions based on their contribution margins.

This study examines the application of marginal costing in business decision-making, a crucial aspect of managerial accounting (Wheldon, 2023). Marginal costing, also known as marginal costing technique, is a method of costing that focuses on the change in total costs resulting from a change in the volume of production and sales (Joseph, 2023; Tamplin, 2023). It is calculated as the change in total cost divided by the change in quantity, and it represents the additional cost of producing one extra unit (WallStreetMojo, 2024).

Recent studies have investigated the role of marginal costing in profit planning and decision-making (Kumar et al., 2020), its application in different industries (Ahmed et al., 2019), and its limitations and challenges (Li et al., 2020).

Absorption Costing

Absorption costing, also known as full costing, is a method of costing that includes all costs associated with manufacturing a particular product. This method is used to determine the cost of a product or service for the purpose of managerial decision-making.

Absorption costing is a managerial accounting method that calculates the total cost of a product by including both variable and fixed costs. It allocates the overhead costs to each unit produced, making it an essential tool for decision-making, pricing, and profit analysis. This costing method has been widely used in various industries for decades.

Absorption costing is a costing method that allocates both variable and fixed manufacturing costs to units of production. Unlike marginal costing, absorption costing treats fixed costs as a part of the cost of production and assigns a portion of these costs to each unit produced. This helps in allocating a fair share of the fixed costs and calculating the total cost per unit, which includes both variable and fixed costs (Horngren, Datar, Rajan, Beaubien, & Graham, 2018).

Abdul et al. (2020) also emphasize that absorption costing provides a more comprehensive view of a product's cost. By incorporating both variable and fixed costs, it allows for a more accurate analysis of profitability at different levels of production. This is because fixed costs, such as rent and utilities, are spread across all units produced, resulting in a higher cost per unit as production levels decrease.

Financial Performance

Financial performance is a thorough evaluation of a company's overall standing in categories such as assets, liabilities, equity, expenses, revenue, and overall profitability (Corporate Finance Institute, 2023).

Net Profit Margin

Net profit margin is a profitability ratio that measures what percentage of revenue and other income is left after subtracting all costs for the business, including costs of goods sold, operating expenses, interest, and taxes. Net profit margin differs from gross profit margin as a measure of profitability for the business in general, taking into account not only the cost of goods sold, but all other related expenses.

Net profit margin (NPM) is a key financial performance indicator that measures a company's profitability and efficiency in generating earnings compared to its revenues (Khan et al., 2022). It is calculated by dividing the net profit by the total revenue, multiplied by 100.

Empirical Review

Gargi Chaudhary and Piyush (2023) examined the impact of cost accounting techniques on profitability of manufacturing industries. This study helps examining costs related to labour, materials, overhead, and other expenses, cost accounting systems can help businesses find inefficiencies and potential areas for improvement in their production processes. The study is qualitative and uses literature studies to analyse the idea of cost accounting system and techniques. A qualitative research methodology was used to collect data. The results reveal that cost control has a positive impact on business profitability and that element of cost, such as materials, labour and overhead cost and workers' behaviour could be strategically controlled with measures like responsibility accounting, data collection and data reporting. The study suggests that effective cost accounting systems can provide management with key insights into the profitability of different products or product lines. By examining cost data, managers may identify which products are the most profitable and which are not, and they can use this knowledge to strategically plan and allocate resources. Systems for cost accounting can also help manufacturing companies comply with regulatory requirements, such as those relating to tax reporting and financial accounting standards. By maintaining accurate records of their expenses and income, organisations may make sure they are abiding by these regulations and avoid getting into problems.

Imo and Ukehinakachi (2022) examined the relationship between Cost Accounting Techniques and Financial Performance of Small and Medium Scale Enterprise in Rivers State. In this study,

we have two variables, Cost Accounting Techniques as the independent variables and Financial Performance as the dependent variable. Both of these variables have their dimensions and measures which will assist the researcher to find out the relationship Cost Accounting Techniques have on Financial Performance of Small and Medium Scale Enterprise in Rivers State. The methodology adopted was descriptive survey design to collect both primary and secondary data. The population of this study consist OF 4,535 registered owners of small and medium scale enterprises in Rivers State in Rivers state. The sampling technique used was the non- probability sampling technique, also the sample size was determined using the Taro Yamane's formula (1964) which was 367. The instrument used for data collection was the questionnaire in five Likert scale. 367 copies of questionnaire were distributed which 248 was retrieved for the analysis. The Cronbach alpha was adopted in assessing the reliability of the study instrument. The data were analyzed using simple percentage and mean score, while hypotheses were tested using the Spearman Ranking Order Correlation with the help of SPSS to establish the significance of relationship between the various variables used in the Study. The result indicated that there is a significant relationship between Cost Accounting Techniques and Financial Performance y. From the above it was recommended that Small scale business operator units should ensure that complete and accurate business records are kept because they are essential for decision making. This can be ensured by undertaking course training about records keeping, and hiring knowledgeable and skilled workers.

Kadhim and Al-Ghezi (2021) investigated on Using Attribute-Based Costing to Conduct Efficient Customer Profitability Analysis in Small and Medium-Sized Manufacturing Businesses. This research aims to show both cost technology based on ABC II specifications and customer The study seeks to demonstrate both cost technology and customer profitability analysis based on ABC II standards (CPA as contemporary accounting techniques and money from a significant role in developing the performance of the economic unit compared to traditional cost technologies). Emphasizing the function of cost technology in delivering relevant information to manage the monetary team enables it to examine the profitability of the client and retain customers for the men's clothes factory in Najaf. The purpose of this study is to use cost technology to data collected from the Men's Clothing Factory in Najaf in 2019 through field visits and interviews with department managers and staff in order to examine the profitability of customers within the economic unit research sample. The results indicate that customers whose overall losses grew under the conventional cost system benefit from ABC11 technology's optimum resource utilization and cost reductions while matching customer

requirements and demands. According to the company's conventional system, the client who was losing money was (y) by (16145000) dinars has become a successful customer (5535,000) dinars, which suggests that ABC11is critical in supplying relevant information to accurately measure the profitability of consumers.

Based on the review of literature, the following hypotheses were raised:

Ho_1: There is no significant relationship between marginal costing and net profit margin of Industrial goods manufacturing firms in Nigeria

Ho_2: There is no significant relationship between absorption costing and net profit margin of Industrial goods manufacturing firms in Nigeria

METHODOLOGY

The study adopted the survey research design. The population of this study is based on the fourteen (14) quoted industrial goods manufacturing companies on the floor of Nigeria exchange group.

The probability technique was adopted, the size was limited to ten (10) industrial goods manufacturing companies and representing all the various industrial goods manufacturing companies in Nigeria. Out of the ten (10) selected industrial goods manufacturing companies, ten (10) respondents made up of staff who are knowledgeable in the variables under study and who work in the relevant departments were selected from each of the company. Thus a total of one hundred (100) respondents were used as a unit for the study. The form of data collected through the use of questionnaire is a primary data questionnaire were administered. The study statistical data analysis shall involve the following: factor analysis, frequency table, percentages, bar chart, reliability, correlation and linear regression analysis with the use of Statistical Package for Social Sciences (SPSS) version 23.0. Thus, the study shall use both descriptive and inferential analyses.

The descriptive analyses shall be used to determine the demographics of the respondents while the inferential analyses (Linear Regression Analyses) shall be deployed to test the hypotheses.

RESULT AND DISCUSSIONS

Table 1.2: Reliability Coefficient Table showing the Cronbach's Alpha of all Variables of the Study

Variable	Cronbach's Alpha
Marginal Costing	0.777

Absorption Costing	0.735
Net Profit Margin	0.709
Return on Asset	0.719

Source: SPSS Output, 2024

Table 1.2 shows the Cronbach's alpha of all the variables of the study. It revealed that Marginal Costing had a Cronbach's alpha of 0.777, Absorption Costing had a Cronbach's alpha of 0.735, Net Profit Margin had a Cronbach's alpha of 0.709 while Return on Asset had a Cronbach's alpha of 0.719. All the variables of the study had Cronbach's alpha value ≥ 0.7, which is the required Cronbach's alpha value for the study. Accordingly, the researcher concludes that all items of the variables of the study are reliable. Hence, if the same set of items of the variables are re-administered to respondents the same result would also be obtained.

Table 1.3: Descriptive Statistics on Marginal Costing

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
How do Nigerian industrial goods manufacturers calculate the marginal cost of production, and what are the challenges they face	73	3.00	5.00	3.7945	.52596
What are the benefits of marginal costing in decision-making for Nigerian industrial goods manufacturers?	73	3.00	5.00	3.7671	.54059
How does marginal costing help Nigerian industrial goods manufacturers to optimize their production costs?	73	2.00	5.00	3.6438	.63179
Can you explain the impact of marginal costing on the pricing strategy of industrial goods in Nigeria?	73	2.00	5.00	3.7397	.57801
What is the current state of marginal costing practices among industrial goods manufacturers in Nigeria?	73	2.00	5.00	3.7671	.61284
Valid N (listwise)	73				

Source: SPSS Output, 2024

Table 1.3 shows the descriptive statistics on items of Marginal Costing. It was shown that: "How do Nigerian industrial goods manufacturers calculate the marginal cost of production, and what are the challenges they face?" had a mean value of 3.79 and a standard deviation of 0.53; "What are the benefits of marginal costing in decision-making for Nigerian industrial goods manufacturers?" had a mean value of 3.76 and a standard deviation of 0.54; "How does

marginal costing help Nigerian industrial goods manufacturers to optimize their production costs?" had a mean value of 3.64 and a standard deviation of 0.63; "Can you explain the impact of marginal costing on the pricing strategy of industrial goods in Nigeria?" had a mean value of 3.73 and a standard deviation of 0.57; while "What is the current state of marginal costing practices among industrial goods manufacturers in Nigeria?" had a mean value of 3.76 and a standard deviation of 0.61. The mean of all the variables of the study were above 3.0. Therefore, the researcher upheld the prevalence of the variables

Table 1.4: Descriptive Statistics on Absorption Costing

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
What is the prevalence of absorption costing among industrial goods manufacturers in Nigeria?	73	3.00	5.00	3.9452	.43749
. How do Nigerian industrial goods manufacturers absorb overhead costs into product costs, and what are the challenges they face?	73	3.00	5.00	3.9041	.60471
What are the advantages and disadvantages of absorption costing for Nigerian industrial goods manufacturers?	73	3.00	5.00	3.7123	.48532
How does absorption costing affect the financial reporting of industrial goods manufacturers in Nigeria?	73	3.00	5.00	3.8904	.56671
Can you explain the impact of absorption costing on the profitability of industrial goods in Nigeria?	73	3.00	5.00	3.8767	.49848
Valid N (listwise)	73				

Source: SPSS Output, 2024

Table 1.4 shows the descriptive statistics on items of Absorption Costing. It was shown that: "What is the prevalence of absorption costing among industrial goods manufacturers in Nigeria?" had a mean value of 3.94 and a standard deviation of 0.43; "How do Nigerian industrial goods manufacturers absorb overhead costs into product costs, and what are the challenges they face?" had a mean value of 3.9 and a standard deviation of 0.6; "What are the advantages and disadvantages of absorption costing for Nigerian industrial goods manufacturers?" had a mean value of 3.71 and a standard deviation of 0.48; "How does absorption costing affect the financial reporting of industrial goods manufacturers in Nigeria?" had a mean value of 3.89 and a standard deviation of 0.56; and lastly "Can you explain the impact of absorption costing on the profitability of industrial goods in Nigeria?" had a mean

value of 3.87 and a standard deviation of 0.49, the respondents agreed that. The mean of all the variables of the study were above 3.0. Therefore, the researcher upheld the prevalence of the variables.

Table 1.5: Descriptive Statistics on Net Profit Margin

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
How do you calculate the net profit margin for industrial goods in Nigeria?	73	2.00	5.00	4.0274	.64491
What factors influence the net profit margin of industrial goods in Nigeria?	73	3.00	5.00	4.0822	.70225
How does competition in the market affect the net profit margin of industrial goods?	73	3.00	5.00	4.3014	.68079
What strategies do you employ to improve the net profit margin of industrial goods?	73	3.00	5.00	4.2055	.55174
How do you monitor and evaluate the net profit margin over time?	73	3.00	5.00	4.1507	.54445
Valid N (listwise)	73				

Source: SPSS Output, 2024

Table 1.5 shows the descriptive statistics on the items of Net Profit Margin. “How do you calculate the net profit margin for industrial goods in Nigeria?” had a mean value of 4.02 and a standard deviation of 0.64; “What factors influence the net profit margin of industrial goods in Nigeria?” had a mean score of 4.08 and a standard deviation of 0.72; “How does competition in the market affect the net profit margin of industrial goods?” had a mean value of 4.3 and a standard deviation of 0.68; “What strategies do you employ to improve the net profit margin of industrial goods?” had a mean value of 4.2 and a standard deviation of 0.55; and lastly “How do you monitor and evaluate the net profit margin over time?” had a mean value of 4.15 and a standard deviation of 0.54. The mean of all the variables of the study were above 3.0. Therefore, the researcher upheld the prevalence of the variables.

Bivarate Analysis

Table 1.6: Range of Impact and the Descriptive Level of Impact

Range of r values	Descriptive level of Impact r
±0.80 – 1.00	Very strong
±0.60 – 0.79	Strong
±0.40 – 0.59	Moderate

±0.20 – 0.39	Weak
±0.00 – 0.19	Very weak

Decision Rule

If the significant/Probability Value (PV) ≤ 0.05 (level of Significance) = reject the null and conclude Significant Relationship. If the Significant Probability value (PV) > 0.05 (level of Significance) = Accept the null and Conclude Insignificant impact.

Y = a + b*X + e

Where:

Y = dependent variable

a = intercept (constant)

b = slope (regression coefficient)

$H0_1$ Marginal Costing does not impact on Net Profit Margin of industrial goods manufacturing companies in Nigeria.

Table 1.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.489[a]	.239	.229	.87826785

a. Predictors: (Constant), MAG_COST

Table 1.8: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	17.234	1	17.234	22.342	.000[b]
	Residual	54.766	71	.771		
	Total	72.000	72			

a. Dependent Variable: NPM

b. Predictors: (Constant), MAG_COST

Table 1.9: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	-4.280E-16	.103		.000	1.000
	MAG_COST	.489	.104	.489	4.727	.000

a. Dependent Variable: NPM

Source: SPSS Output, 2024

Table 1.7 showed the R^2 is 0.239. This implies that Marginal Costing accounts for only 23.9% of the variation in Net Profit Margin. This means that Marginal Costing explains 23.9% increase in Net Profit Margin.

Table 1.8 revealed that regression has a p-value of 0.000 which is very significant; meaning that Marginal Costing has a very significant impact on Net Profit Margin.

Table 1.9 showed that constant "a" in the regression equation is -4.280E-16. This tells us that when Marginal Costing is 0, Net Profit Margin will be -4.280E-16. The regression coefficient "b" in the equation is 0.489. This means one-unit increase in Marginal Costing will result to 0.489 increase in Net Profit Margin. Also, the p-value of 0.000 which is lower that significant value of 0.05 indicates that there is significant relationship between Marginal Costing and Net Profit Margin. This means that Marginal Costing has statistical effect on Net Profit Margin.

We will reject the null hypothesis and accept the alternate hypothesis.

NPM = a + b * MC + e

NPM = -4.280E-16 + 0.489 * MC + e

$H0_2$ Absorption Costing does not impact on Net Profit Margin of industrial goods manufacturing companies in Nigeria.

Table 1.10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. Change
1	.639[a]	.409	.400	.77448088	.409	49.036	1	71	.000

a. Predictors: (Constant), ABS_COST

Table 1.11: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	29.413	1	29.413	49.036	.000[b]
	Residual	42.587	71	.600		
	Total	72.000	72			

a. Dependent Variable: NPM

b. Predictors: (Constant), ABS_COST

Table 1.12: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-3.198E-16	.091		.000	1.000			
	ABS_COST	.639	.091	.639	7.003	.000	.639	.639	.639

a. Dependent Variable: NPM

Source: SPSS Output, 2024

Table 1.10 showed the R^2 is 0.409. This implies that Absorption Costing accounts for only 40.9% of the variation in Net Profit Margin. This means that Absorption Costing explains 40.9% increase in Net Profit Margin.

Table 1.11 revealed that regression has a p-value of 0.000 which is very significant; meaning that Absorption Costing has a very significant impact on Net Profit Margin.

Table 1.12 showed that that constant "a" in the regression equation -3.198E-16. This tells us that when Absorption Costing is 0, Net Profit Margin will be -3.198E-16. The regression coefficient "b" in the equation is 0.639. This means one-unit increase in Absorption Costing will result to 0.639 increase in Net Profit Margin. Also, the p-value of 0.000 which is lower that significant value of 0.05 indicates that there is significant relationship between Absorption Costing and Net Profit Margin. This means that Absorption Costing has statistical effect on Net Profit Margin.

We will reject the null hypothesis and accept the alternate hypothesis.

NPM = a + b * AC + e

NPM = -3.198E-16 + 0.639 * AC + e

Marginal Costing and Net Profit Margin

The test of hypothesis one (H_{01}), found that in table 4.12 the R^2 is 0.239. This implies that Marginal Costing accounts for only 23.9% of the variation in Net Profit Margin. This means that Marginal Costing explains 23.9% increase in Net Profit Margin. Table 4.13 revealed that regression has a p-value of 0.000 which is very significant; meaning that Marginal Costing has a very significant impact on Net Profit Margin, while table 4.14 showed that constant "a" in the regression equation is -4.280E-16. This tells us that when Marginal Costing is 0, Net Profit Margin will be -4.280E-16. The regression coefficient "b" in the equation is 0.489. This means one-unit increase in Marginal Costing will result to 0.489 increase in Net Profit Margin. Also, the p-value of 0.000 which is lower that significant value of 0.05 indicates that there is significant relationship between Marginal Costing and Net Profit Margin. This connotes that Marginal Costing has statistical effect on Net Profit Margin.

This finding is in line with the study of Smith and O'Brien (2022) which dwelled on the Effect of Marginal Costing on Net Profit Margin: A Comparative Study. This empirical study analyzed data from manufacturing firms listed on the New York Stock Exchange from 2018 to 2021. The researchers used regression analysis to examine the relationship between marginal costing application and net profit margins. The results indicated that firms using marginal costing methods had higher net profit margins compared to those using absorption costing methods. The flexibility in pricing and better decision-making regarding production levels contributed to the improved profit margins. Marginal costing positively impacts net profit margins by allowing firms to better manage production costs and pricing strategies.

Absorption Costing and Net Profit Margin

The test of hypothesis three (H_{03}), found that in table 4.18 showed the R^2 is 0.409. This implies that Absorption Costing accounts for only 40.9% of the variation in Net Profit Margin. This means that Absorption Costing explains 40.9% increase in Net Profit Margin, while table 4.19 revealed that regression has a p-value of 0.000 which is very significant; meaning that Absorption Costing has a very significant impact on Net Profit Margin. Also, table 4.20 showed that that constant "a" in the regression equation -3.198E-16. This tells us that when Absorption Costing is 0, Net Profit Margin will be -3.198E-16. The regression coefficient "b" in the equation is 0.639. This means one-unit increase in Absorption Costing will result to 0.639 increase in Net Profit Margin. Also, the p-value of 0.000 which is lower that significant value of 0.05 indicates that there is significant relationship between Absorption Costing and Net Profit Margin. This means that Absorption Costing has statistical effect on Net Profit Margin.

This finding is in line with the study of Kumar and Patel (2022) that examined the Influence of Absorption Costing on Net Profit Margins in the Manufacturing Sector. Using a sample of 100 manufacturing firms, the study applied a mixed-method approach, combining quantitative financial analysis with qualitative interviews. Regression analysis was used to determine the impact of absorption costing on net profit margins. The findings revealed that absorption costing, while compliant with accounting standards like GAAP, often led to lower net profit margins due to the allocation of fixed overheads to product costs, which could distort pricing and profitability. While necessary for compliance, absorption costing can negatively impact net profit margins, highlighting the need for supplementary costing methods for internal decision-making.

Conclusion and Recommendation

This study empirically investigated the relationship of costing methods and profitability of quoted industrial goods manufacturing companies in Nigeria, and the following conclusions were drawn:

That Marginal Costing has a positive moderate and significant impact on Net Profit Margin of quoted industrial goods manufacturing companies in Nigeria. That Absorption Costing has a positive strong and significant impact on Net Profit Margin of quoted industrial goods manufacturing companies in Nigeria. In view of the findings, conclusion and implications of this study, the following recommendations were made: firms should adopt marginal costing to leverage its benefits in flexible pricing strategies. By focusing on variable costs, firms can make more informed decisions about product pricing, potentially leading to higher net profit margins. Firms should improve inventory management practices to avoid overproduction and excessive inventory holding costs, which can negatively impact financial performance under absorption costing.

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