



<http://www.casestudiesjournal.com/>

Impact Factor: 4.428

Artificial Intelligence Adoption and Market Growth Rate of Deposit Money Banks in Nigeria

Author's Details:

Omoniyi Alabi, ADEOSUN (PhD)¹ -An Associate Professor, Department of Accounting

Omoniyi Jacob, ENIOLA (PhD)² An – An Associate Professor, Department of Accounting

Dr John Ayodele ADEKANMBI (PhD)³ A Senior Lecturer, Department of Accounting

Department of Accounting, School of Management Sciences, College of Social & Management Sciences, Bamidele Olumilua University of Education, Science and Technology, Ikere- Ekiti, Ekiti – State.

Email: adeosun.omoniyi@bouesti.edu.ng : eniola.jacob@bouesti.edu.ng: adekanmbi.john@bouesti.edu.ng

Abstract

Artificial intelligence in the banking sector in Nigeria is just emerging and the awareness level is generally extremely low. This is not unconnected to the huge amount involved in investing in Artificial Intelligence in banking sub sector to solve analytic and customer automation problems that helps in ensuring smooth transactions and seamless service delivery in the bank irrespective of the level of educated and uneducated customers of the banks. This research aims to investigate the relationship between AI adoption and market growth in Nigerian Deposit Money Banks (DMBs). This study employed ex-post facto research design. The population for this study included all deposit money banks operating in Nigeria. The study used deposit money banks that are vast in ICT and has considerably investment in the use of AI as the target population which includes; Access bank, Zenith bank, First bank of Nigeria, Guaranty trust bank, Eco bank, Fidelity bank, Sterling bank and Union Bank. Through the analysis of secondary data from annual financial statements of DMBs that are advanced in AI usage, several significant insights emerged. The adoption of AI has proven to be a game-changer for DMBs in Nigeria, particularly in enhancing cost effectiveness and improved profitability. AI-driven technologies such as automation, machine learning, and predictive analytics have significantly reduced operational costs, improved decision-making, and facilitated fraud detection, all of which have contributed to enhanced profitability. It is recommended that Deposit money banks (DMBs) in Nigeria should prioritize increased investment in AI infrastructure and talent development. Developing in-house AI expertise will allow banks to implement AI-driven solutions tailored to their unique needs that will enhance operational efficiency and long-term growth.

Keywords: Artificial Intelligence, Revenue Growth, Research and Development, Firm Performance

Introduction

Artificial intelligence's (AI) transformative impact has been profound since its advent, changing how enterprises, including those in the banking and finance sector operate and deliver services to customers. The introduction of AI in banking apps and services has made the sector more customer-centric and technologically

relevant. AI-based systems are now helping banks reduce costs by increasing productivity and making decisions based on information unfathomable to a human. More interestingly, intelligent algorithms can spot fraudulent information in a matter of seconds. Over the past decade, Nigeria's banking landscape has transformed from one that relies heavily on cash transactions to one that is driven by internet banking and artificial intelligence (AI), (Wigwe, 2019).

Artificial intelligence is the machines (programs) that operate in the simulation of human intelligence (Łapińska et al., 2021) in technologies, such as machine learning, data mining, natural language processing, image recognition (Khalid, 2020). Artificial Intelligence (AI) has the ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation (Kaplan & Haenlein, 1987). Artificial Intelligence is applied when a machine mimics cognitive functions that associate with other human minds, such as learning and problem solving in order to maximize the chance of successfully achieving project goals. Therefore, AI helps organizations to automate routine and repetitive tasks, freeing up employees to focus on more complex and creative work and provide insights and recommendations based on vast amounts of data, enabling organizations to make more sound and informed decisions.

Nearly 80% of banks are aware of the potential benefits of AI in banking. AI, with its ability to analyze vast amount of data and identify patterns indicative of suspicious behaviour, serves as proactive defense mechanism against cyber threats (Farayola, 2024). Another report by McKinsey, (2020) suggests the potential of AI in banking and finance would grow as high as \$1 trillion. These numbers indicate that the banking and finance sector is swiftly moving towards AI to improve efficiency, service, and productivity and reduce costs. The application of AI has positively enhanced efficiency, effectiveness, and productivity which has improves customer satisfaction, and boosts the overall performance of selected deposit money banks in Nigeria. The heavy manual transactions of deposit money banks (DMBs) have been replaced by internet banking due to the adoption of AI, because of the growth in financial data and the processing capacity needed to enable real-time responsiveness to the constantly growing demands of financial data consumers. Firms have moved away from this traditional method by incorporating modern technology which subsequently has a profound impact on the service industry (Zeithaml & Bitner, 2003). This continues to develop significantly by enabling both customers and employees to deliver and receive an efficient service (Bitner, 2001).

AI-powered analysis of customer data can enable deposit money bank's (DMBs) to provide highly personalized services and products, which can lead to higher customer satisfaction and loyalty, as well as increased revenue. AI can automate manual processes, reducing the need for human intervention and minimizing operational costs (Prabhod, 2024). This, in turn, can increase profitability for DMBs. AI can influence market growth rate is by increasing efficiency and automation (Acemoglu & Restrepo, 2018). By using AI algorithms, businesses can automate many of their processes, such as data analysis, customer service, and logistics (Bortolotti & Romano, 2012). This can lead to reduced costs and increased efficiency, as human workers are freed up to focus on more strategic tasks. As a result, businesses are able to respond more quickly to market changes and customer demands, leading to faster growth.

Market growth rate is a measure by the increase or decrease in the size of a certain market over a specified period of time. It indicates the rate at which a market expands or contracts and is usually stated as a percentage. A high market growth rate suggests that there is increasing demand for products or services within that market, while a low growth rate may indicate saturation or declining interest. Market growth rate factor include changes in consumer demand, technological advancements, regulatory developments, and competitive dynamics within the industry (Adrian et al., 2024). Understanding the market growth rate is crucial for industry as it indicate opportunities for expansion, assess the potential for new product launches, and make informed decisions about resource allocation and strategic planning. Monitoring market growth rate trends allows businesses to adjust their marketing strategy, pricing models, and distribution channels to capitalize on emerging possibilities and

stay ahead of the competition. The increase in market growth rate has led to greater customer satisfaction with deposit money banks, as banks are able to offer more.

In the work carried out by Technavio (2021) he opined that artificial intelligence (AI) in marketing market share is expected to increase to USD 31.72 billion from 2021 to 2026, at an accelerating CAGR of 26.84 %. The rise in adoption of cloud-based applications and services is notably driving the artificial intelligence in marketing growth. Brown et al. (2019) stated that the use of these technologies may result in a broad variety of positive outcomes, including increased customer experiences, greater operational efficiency, more efficient risk management, and sophisticated data analytics. The adoption of AI in deposit money banks can unlock new opportunities for growth by improving risk management, decision-making, operational efficiency, and personalized services. AI systems can scan large amounts of data in real time to spot trends and abnormalities, allowing banks to identify risks more effectively. Banks can improve risk management practices to reduce losses from fraud and non-performing loans, which can boost profitability and growth.

Artificial intelligence in the banking sector in Nigeria is just emerging and the awareness level generally is extremely low (Techpoint. Africa 2019). This is as a result of the huge amount involved in investing in Artificial Intelligence in banking to solve analytic and customer automation problems in ensuring smooth transaction and service delivery in the bank as well as the level of educated and uneducated customers patronizing banks for transactions (Emeka, 2019). The increasing adoption of artificial intelligence (AI) in banking has raised questions about its potential impact on market growth in Nigerian deposit money banks (DMBs). While AI promises increased efficiency, personalization, and innovation, it also poses challenges such as job displacement and security risks. This research aims to investigate the relationship between AI adoption and market growth in Nigerian DMBs.

Significance of the Study

The study will address the effect of adoption of artificial intelligence (AI) on market growth rate in deposit money banks in Nigeria. With this study, deposit money banks will be able to understand banking in a new dimension. Studying the topic of artificial intelligence adoption and market growth rate in deposit money banks holds significant importance in the financial industry and understand banking in a new dimension. The adoption of artificial intelligence technologies in deposit money banks has the potential to enhance operational efficiency, improve customer service, and drive innovation in financial products and services. Understanding how AI adoption affects market growth rates can provide insights into the competitive landscape of the banking sector and help banks leverage technological advancements to stay ahead in the market.

Literature Review

Artificial Intelligence

In order to understand the concept of artificial intelligence, it is essential to first define artificial intelligence and then what intelligence entails. Artificial is something that is developed by humans rather than it occurring naturally (Mikalef and Gupta 2021) while Intelligence refers to mental activities, reasoning, learning and understanding (Lichtenthaler, 2019). When the two concepts are combined together as artificial intelligence, it means the development of machines by human that is capable of stimulating intelligence. Artificial intelligence is the process of giving the computer human-like capabilities so as to carry out tasks that would typically require human intelligence. These tasks include reasoning, learning, understanding and problem solving.

Benko and Lanyi in Wamba-Taguimdje et al (2020) define artificial intelligence as a set of theories and techniques used to create machines that are capable of stimulating intelligence. Selfridge and Simon in Wamba-Taguimdje et al (2020) defined artificial intelligence as the use of computer to model intelligent behavior with minimal human intervention. McCorduck et al in Wamba-Taguimdje et al (2020) described artificial

intelligence as the use of technological devices to reproduce the cognitive abilities of humans to achieve objectives autonomously, taking into account any constraints that may be encountered.

Artificial intelligence and its components (machine learning, deep learning, Chabot, neural network, virtual assistant and others) are fundamentally reshaping the business processes (Kuzey et al, in Wamba-Taguimdje et al, 2020). AI has become increasingly popular in business as it helps organizations to improve their performance, reduce costs, and enhance customer satisfaction (Elegunde, and Osagie, 2020). Artificial intelligence has advanced significantly since the introduction of machine learning (automated learning from datasets), including Deep Learning (which uses neural networks) (Buchanan, in Wamba-Taguimdje et al., 2020). Instead of modeling enormous volumes of information, machine learning techniques are used to train neural networks, which learn by digesting millions of test data (Zemouri et al, in Wamba-Taguimdje et al., 2020). When paired with large data, machine learning and neural network processing can outperform human activities in terms of speed and relevancy (Wamba-Taguimdje et al, 2020).

Global business requires AI integrated global solutions that establish a secure framework or set of regulations in sectors such as crypto currency, legalized personal hacking, business model automation, and others (Erdélyi & Goldsmith, 2018). Artificial Intelligence (AI) is broadly defined as the simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning, problem-solving, perception, and language understanding (Russell & Norvig, 2020). AI uses a wide variety of technologies, such as machine learning, deep learning, and natural language processing. Self-learning systems, perception, speech recognition, decision-making and language translation are all made possible by these technologies.

Artificial Intelligence in Deposit Money Bank

Artificial intelligence (AI) in the banking industry refers to the use of advanced computational algorithms and data processing techniques to improve various financial services, operational efficiency, and customer relations. AI comprises a variety of technologies, such as machine learning, natural language processing, and robotic process automation, all of which help to transforming traditional banking operations. AI systems in banking are designed to analyze large datasets, uncover patterns, and make predictions, which can significantly improve decision-making processes. For instance, machine learning algorithms can assess creditworthiness by assessing various data sources, resulting in more accurate loan decisions (Duan et al., 2019)

Artificial Intelligence (AI) is increasingly transforming the banking sector, influencing operational efficiency, customer experience, and market growth. The integration of AI technologies in deposit money banks has become a focal point of research, examining how these innovations drive competitiveness and profitability. AI applications in banking encompass various functionalities, including fraud detection, credit scoring, customer service automation, and personalized marketing. For example, machine learning algorithms examine transaction data to find suspicious patterns, hence improving fraud detection techniques (Ngai et al., 2011). Moreover, chatbots and virtual assistants are transforming customer service by providing 24-hour support and improving user engagement (Serrano-Cinca et al., 2021). The use of AI technologies also addresses operational issues like fraud detection and risk management. By continuously monitoring transactions in real time, AI can detect anomalies that indicate fraudulent activity, improving security measures (Bharadwaj et al., 2021). Furthermore, AI-powered predictive analytics can help banks anticipate market trends and client need, enabling for better strategic planning and service customization. In essence, AI in the banking industry is a powerful tool for improving operational efficiency, increasing customer engagement, and enabling data-driven decision-making. Its transformative potential is evident in a variety of applications, ranging from risk assessment to customer service automation, making it an essential component of modern banking strategy.

Artificial Intelligence and Revenue Growth

Revenue growth represents the upsurge in the sales or revenue of a company for a specific period, typically expressed as a percentage. It is a key indicator of a company's financial health and performance, reflecting its ability to expand its business operations, attract new customers, or increase sales to existing customers. Revenue growth can be ascertained by comparing the revenue earned from one period to another, such as year-over-year or quarter-over-quarter. Positive revenue growth is often seen as a sign of a successful business strategy, while negative growth may indicate challenges or declining market demand.

Revenue growth in deposit money banks requires a nuanced understanding of the industry's unique characteristics and the various factors at play. Simply stating a percentage increase in revenue isn't enough; but it delves deeper into the drivers, potential pitfalls, and implications for the bank's future. The revenue growth in deposit money banks requires a multifaceted approach. While growth is generally positive, it's crucial to understand the underlying drivers which may include; the credit risk that is associated with interest income growth, non-interest growth, competitive strength, ability to attract and retain customers, and the risk associated with integration and post-merger performance. Secondly, the potential pitfalls that are associated with positive growth.

Artificial intelligence (AI) is revolutionizing the banking industry, offering deposit money banks a potent tool to drive revenue growth. While AI offers immense potential for revenue growth in deposit money banks, it is important for banks to address the challenges and risks associated with AI adoption, ensuring ethical and responsible implementation so as to understand the complexities, limitations, and potential pitfalls of revenue growth in deposit money banks. By carefully navigating these complexities, AI can be a powerful catalyst for driving both revenue and customer satisfaction, ultimately shaping the future of banking.

Theoretical Review

Innovation Diffusion Theory

Innovation Diffusion Theory, developed by Rogers (1962), explores how, why, and at what rate new ideas and technologies spread among individuals and organizations. It can be applied to study how AI technologies are adopted and diffused within the banking sector. These theories explain individuals' intention to adopt a technology as a modality to perform a traditional activity (Simon & Senaji, 2016). The motivating factor that drives individuals' intention to adopt modern technology to perform traditional activities is relative advantage which is expected to be gain. The theory examines how new technologies or ideas gain acceptance and spread through different segments of a population. Olannyei et al. (2017), innovation diffusion theory describes how individuals and organizations accept technology as a modality to perform their traditional operations. It is all about the intention of the individuals or organization to embrace modern technology to perform their activities efficiently.

The innovation diffusion theory is highly useful in studying the motives behind the adoption of artificial intelligence technologies in manufacturing firms. This theory emphasizes that the motivation for the use of technology is to improve corporate operations and obtain a competitive advantage over larger rivals. Theory provides a valuable lens for analyzing how innovations spread and are adopted within various contexts. By examining factors such as the innovation's attributes, communication channels, and social systems, the theory offers insights into the dynamics of innovation adoption and the factors that can accelerate or impede its diffusion. Idowu et al (2016), companies considered it beneficial to adopt artificial intelligence technologies in their operation because of its potentials in improving their marketing performance. This has resulted in the development of machine learning technologies, which made it possible to learn from data and execute tasks that humans do. This theory is relevant to this study looking at the rate at which AI is gradually spreading in the banking sector in Nigeria. IDT is a useful tool for assessing technological acceptability, evaluating its potential, and implementing it

Empirical Review

Adeyemo and Okoronkwo (2024) examines the effect of Artificial Intelligence (AI) on the operational efficiency of deposit money banks in Lagos State, Nigeria. The study identified the types of AI technologies that are used by banks and examined the impact of the different types of technologies on the operational efficiency of five deposit money banks. A Survey research design were adopted and 450 copies of the questionnaire were administered to regular employees selected randomly from the five banks. The study concluded that artificial intelligence significantly contributed to the operational Artificial Intelligence for fraud detection in deposit money banks in Nigeria The study recommend that deposit money banks should effectively make use of artificial intelligence, especially deep learning, automation, and fraud detection, to improve organizational efficiency.

Ayeni and Eriabie (2024) investigated the integration of artificial intelligence (AI) for fraud detection in internationally authorized banks, focusing on Nigerian banking institutions. The study administered questionnaires to bank staff in order to gather in-depth insights using a descriptive survey research design and quantitative methods. The findings suggest that AI implementation can significantly enhance the quality and security of banking transactions. In conclusion, the study advocates for deposit money banks to embrace AI technologies in their operations and collaborate with reputable cyber security firms for ongoing updates and support.

Emeh (2024) carried out a research on management of artificial Intelligence and the performance of manufacturing firms in Enugu state Nigeria with the objectives to examine the effect of infrastructural development on the performance of manufacturing firms and evaluate the effect of workforce skills on the performance of manufacturing firms in Enugu State Nigeria. A descriptive research design was adopted for the study and structured questionnaire was used to collect data for the study. The study concluded that the Management of artificial intelligence has a significant effect on the performance of manufacturing firms in Enugu State Nigeria. The study recommended that, government authorities and relevant stakeholders should prioritize investment in infrastructural development to provide a conducive environment for AI implementation in manufacturing firms.

Salemcity and Aiyesan (2023) examined the effect of AI on employee cost and other operating cost in the banking sector. The study adopted *expost facto* research design and secondary data were gathered between 2012 and 2022 from the respective financial statements of the DMBs and analyzed using panel regression model. The study concluded that the adoption of AI by DMBs in Nigeria will improve their corporate operating activities which will translate to improve financial performance. Government should regulate the activities of DMBs to forestall any form of laying off. Chukwudi and Chinedu (2023) examined artificial intelligence adoption and marketing performance of quoted manufacturing firms in Nigeria. Positivism research philosophy and correlational research design was adopted and structured questionnaire was used to obtain data from 426 managers from the 71 quoted manufacturing firms in Nigeria. The study recommended that quoted manufacturing firms in Nigeria especially those that are experiencing poor marketing performance should adopt artificial intelligence technologies in their marketing operations as it would improve their marketing performance.

Oduwole and Olukunle (2023) critically examined the impact of artificial intelligence on accounting practice in the Nigerian banking industry. The data for this study were obtained from a primary source where a survey was carried out on banking industries in Nigeria. The findings revealed that all three variables (automation process, expert system, and intelligent agent) have a significant effect on accounting practice in deposit money banks (DMBs) industries in Nigeria. It was recommended that banking industries and accountants, by improving their knowledge of artificial intelligence and enhancing their performance, will be able to eliminate some unwanted accounting costs. Okoliko and Chidiebere (2023) assessed the impact of artificial intelligence on the

performance of selected deposit money banks in FCT, Abuja, Nigeria. A cross-sectional descriptive research design was adopted by the researcher through the use of a structured questionnaire designed for this purpose. Findings from this study showed that the adoption of Artificial Intelligence positively and significantly enhances efficiency, effectiveness, and productivity, improves customer satisfaction, and enhances the overall performance of the selected deposit money banks in FCT, Abuja, Nigeria. The study recommended appropriate digital education for customers and employees of the selected deposit money banks in FCT, Abuja, Nigeria to enjoy some of the gains brought about by the use of Artificial Intelligence to enhance competitive advantage and outperform their competitors.

Owonifari et al. (2023) researched on evaluation of artificial intelligence and efficacy of audit practice in Nigeria. The study sought to examine the impact of AI on audit practice in Nigeria by employing a survey research design. The population of this study comprises 89 accounting firms operating in the Ikeja Local Government area of Lagos State, with a sample size of 62 firm's selected using purposive sampling. The study concluded that the use of AI will enable auditors to predict future trends and make more informed decisions that focus on improving audit practice. The study recommended constant training of accountants and audit personnel on the use of data mining techniques to improve audit practice, investment in machine learning tools by audit firms in Nigeria, and increased use of image recognition to assist in object classification.

Onuora (2023) in his study evaluates the effect of artificial brain power on corporate performance of listed deposits money banks in Nigeria. The study employed ex-post facto and longitudinal research design. The result revealed that automated chat bot has positive and significant effect on Return on Assets (corporate performance) of quoted deposit money banks in Nigeria while a negative but statistically significant effect was documented between deep learning machine and Return on Assets all at 5% level of significance respectively. It recommend that management of listed deposit money banks in Nigeria should strategically endeavor to engage the services of Chat bots in their operations to assist in communication with users.

Akpanobong, and Essien(2022) investigated Artificial Intelligence (AI) adoptions for financial process innovation by commercial banks in Nigeria Descriptive survey research design was employed for the study. Findings of the study reveal that AI can be applied for fraud detection and personalized banking experience. Furthermore, Experts (Bankers and Accounting Lecturers) do not differ significantly on their responses on adoption artificial intelligence (AI) in fraud detection, and personalized banking experience in promoting financial process innovation by commercial banks in Nigeria. It is recommended among others that AIs should be systematically implemented by banks not just as a form of competition but as an overall business strategy.

Drydakis (2022) also empirically examined the effect of AI on SMEs' business risk in London. He engaged 317 SMEs and analyzed the data gathered using regression analysis. The study revealed that the application of AL on online customers, cash flow forecasting and human resources of the SMEs reduced the business risk drastically. The study concluded that SMEs should leverage on technology to enhance their business operation which tends to reducing cost thereby boosting their financial performance.

Noordin et al (2022) examined the use of artificial intelligence and audit quality: An analysis from the perspectives of external auditors in the UAE It investigates whether there is a perception among external auditors toward the contribution of AI to audit quality. Data were collected using an online survey from 22 local and 41 international audit firms to achieve these research objectives. We found that the analysis shows that there is a non-significant difference in the perceived contribution of AI to audit quality between local and international audit firms. All the audit firms, whether local or international, have equal perceived contributions with regard to the audit quality.

METHODOLOGY

This study employed *ex-post facto* research design. The population for this study included all deposit money banks operating in Nigeria. The study used deposit money banks that are vast in the use of AI as the target population which includes; Access bank, Zenith bank, First bank of Nigeria, Guaranty trust bank, Eco bank, Fidelity bank, Sterling bank and Union Bank. A purposive sampling technique was employed to select deposit money banks that are rich in information necessary and relevant for the research work. Data are collected from annual financial statements of the sampled banks to obtain information on market growth rates, profitability, and AI adoption trends. Based on the study objectives, the research employed multiple regression models to assess the impact of artificial intelligence (AI) adoption on various financial performance indicators (cost reduction, profitability, revenue growth, and return on asset) of deposit money banks in Nigeria. The model used for the study is specified as;

$$RG_{it} = \alpha + \beta_1 AI_{it} + \beta_2 R\&D_{it} + \dots + \epsilon_{it} \quad (4)$$

Where: (i = 1, 2, N) (t = 1, 2, t). RA = Revenue Growth; R&D = Research and Development
N = Number of companies or cross-section t = Number of time period ; α = intercept; β_1 = Coefficient of regression; ϵ_i = Error term

The collected data was analyzed using both descriptive and inferential statistics. Descriptive statistics will include the use of frequency distributions, percentages, means, and standard deviations to summarize the data. For inferential statistics, multiple regression analysis will be employed to test the relationship between variables.

DATA ANALYSIS AND INTERPRETATION

Descriptive Statistics

The mean cost reduction among the sampled banks is 19.07%, indicating that, on average, AI adoption has contributed to a 19% decrease in operational costs. The standard deviation of 8.85% further supports this variability, suggesting moderate differences in cost reduction outcomes. The Jarque-Bera test probability of 0.148 suggests that the data does not deviate significantly from normality. Profitability, as measured by the profit margin, has a mean of 33.73%, reflecting a strong financial performance across the banks following AI adoption. The standard deviation of 12.38% points to considerable variation in profitability outcomes.

The mean return on assets (ROA) for the sampled banks is 6.08%, indicating that, on average, banks are generating a 6% return on their assets after AI adoption. The standard deviation of 3.09% shows that ROA varies considerably among banks. The Jarque-Bera probability of 0.000083 indicates a significant deviation from normality, driven by the skewness and kurtosis of the data.

Revenue growth has a mean of 25.52%, showing that, on average, banks experienced a revenue increase of about 25% after adopting AI technologies. The standard deviation of 12.69% suggests a moderate to high level of variability in revenue growth outcomes.

AI software and hardware capitalization, representing the banks' investment in AI technologies, has a mean value of ₦17.85 billion. The standard deviation of ₦14.50 billion points to considerable disparity in AI investments. The kurtosis of 4.99, together with the Jarque-Bera probability of 0.000001, indicates a leptokurtic distribution with significant deviations from normality, driven by a few banks with extremely high investments. Research and development expenditure has a mean value of ₦11.60 billion, reflecting the banks' commitment to AI-driven innovation. The standard deviation of ₦10.11 billion indicates substantial variability in R&D spending.

Table 1. Descriptive Statistics

	Revenue Growth (%)	AI Software and Hardware Capitalization (₹ billion)	Research and Development Expenditure (₹ billion)
Mean	25.52143	17.84643	11.59821
Median	22.65000	13.50000	8.350000
Maximum	62.20000	69.20000	45.60000
Minimum	8.500000	1.900000	0.900000
Std. Dev.	12.68509	14.50100	10.11106
Skewness	0.818814	1.452530	1.445615
Kurtosis	3.076161	4.986440	4.750485
Jarque-Bera Probability	6.271123 0.043475	28.89906 0.000001	26.65462 0.000002
Sum	1429.200	999.4000	649.5000
Sum Sq. Dev.	8850.134	11565.34	5622.850
Observations	56	56	56

Source: Researcher computation, 2024

Correlation Statistics

AI software and hardware capitalization, representing the banks' investment in AI infrastructure, exhibits strong positive correlations with all other variables. The highest correlation is with research and development expenditure ($r = 0.979$, $p < 0.01$), implying that banks investing heavily in AI hardware and software also tend to allocate significant resources to R&D. This relationship underscores the interconnectedness of physical AI infrastructure and the strategic focus on innovation through research, indicating that banks committed to AI technology development are more likely to support it with robust R&D investments.

Similarly, AI capitalization has strong correlations with revenue growth ($r = 0.777$, $p < 0.01$), suggesting that banks with more AI investments tend to generate better returns on their assets and experience significant revenue growth. R&D expenditure correlations with revenue growth ($r = 0.703$, $p < 0.01$) further highlight the importance of R&D in improving overall financial performance. Banks that prioritize research into AI applications tend to achieve higher returns on their assets and experience more substantial revenue growth, indicating that R&D investments can translate directly into financial gains.

Table 2. Correlation Statistics

	AI	R&D	RG
AI	1 56		
R&D	.979** .000 56	1 56	
RG	.777** .000 56	.703** .000 56	1 56

Source: Researcher computation, 2024

Regression Analysis

The correlation coefficient (R) of 0.827 indicates a strong positive relationship between the independent variables (AI Software and Hardware Capitalization and R&D Expenditure) and the dependent variable (Revenue Growth). This suggests that AI and R&D investments significantly contribute to the revenue growth experienced by the banks. The R-Square value of 0.684 means that 68.4% of the variation in revenue growth is explained by AI Software and Hardware Capitalization and R&D Expenditure. This high proportion shows that the model accounts for a large part of the variability in revenue growth, indicating that these factors are strong drivers of revenue performance. The adjusted R-Square of 0.672, slightly lower than the R-Square, suggests that after adjusting for the number of predictors in the model, approximately 67.2% of the variation in revenue growth is still explained by AI and R&D investments. This minimal difference indicates the model's stability and robustness, with little risk of overfitting.

The F-statistic of 57.424 is large, signifying that the overall regression model is highly significant. This means that the independent variables (AI Software and Hardware Capitalization and R&D Expenditure) collectively have a significant effect on revenue growth. The p-value of less than 0.05 ($p = .000$) indicates that the model is statistically significant at the 1% level. This confirms that the relationship between AI, R&D investments, and revenue growth is not due to random chance, and the predictors have a meaningful effect on revenue growth.

The constant value of 12.352 represents the expected revenue growth when both AI Software and Hardware Capitalization and R&D Expenditure are zero. This baseline value suggests that even in the absence of AI and R&D investments, the banks can achieve an average revenue growth of 12.35%. This may reflect inherent capabilities in generating revenue, possibly due to other factors such as market conditions or existing operational efficiency.

The coefficient for AI Software and Hardware Capitalization is 1.890, meaning that for every ₦1 billion increase in AI investments, revenue growth increases by approximately 1.89 percentage points, holding all other factors constant. The p-value of 0.000 indicates that this effect is highly statistically significant. This finding highlights the positive and substantial impact of AI investments on revenue growth, suggesting that banks leveraging AI technologies are better able to scale their operations and generate higher revenue. The standardized beta coefficient (2.161) further emphasizes AI's importance, showing that it has a strong influence on revenue growth relative to other factors.

The coefficient for R&D Expenditure is -1.773, indicating that for every ₦1 billion increase in R&D spending, revenue growth decreases by approximately 1.77 percentage points, all else being equal. The negative coefficient suggests that R&D investments may not yield immediate returns in terms of revenue growth. The p-value of 0.001 shows that this relationship is statistically significant. This result may reflect the fact that R&D investments are often associated with long-term innovation, requiring time to translate into marketable products or services that can drive revenue growth. In the short term, R&D may be viewed as a cost without immediate financial gains, which could explain its negative impact on revenue growth.

Model Summary^b

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Durbin-Watson
1	.827 ^a	.684	.672		7.2613	1.011

a. Predictors: (Constant), Research and Development Expenditure, AI Software and Hardware Capitalization

b. Dependent Variable: Revenue Growth (%)

ANOVA^b

Model	Sum of Squares	df	Mean Square	F	Sig.
-------	----------------	----	-------------	---	------

1	Regression	6055.611	2	3027.806	57.424	.000 ^a
	Residual	2794.523	53	52.727		
	Total	8850.134	55			

a. Predictors: (Constant), Research and Development Expenditure, AI Software and Hardware Capitalization

b. Dependent Variable: Revenue Growth (%)

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.352	1.573		7.853	.000
	AI Software and Hardware Capitalization	1.890	.335	2.161	5.644	.000
	Research and Development Expenditure	-1.773	.480	-1.413	-3.691	.001

a. Dependent Variable: Revenue Growth (%)

Discussion of findings

The empirical studies reviewed provide a comprehensive understanding of the effect of Artificial Intelligence (AI) on revenue growth. Adeyemo and Okoronkwo (2024) and Elegunde and Oladimeji (2020) both highlight the significant positive impact of AI on operational efficiency in Nigerian banks. Adeyemo and Okoronkwo found that AI technologies such as deep learning, automation, and fraud detection significantly enhance the efficiency of banking operations. Similarly, Elegunde and Oladimeji concluded that AI contributes to operational efficiency and business performance, recommending full AI adoption for greater value and effectiveness. The studies by Ayeni and Eriabie (2024) and Akpanobong and Essien (2022) underscore the importance of AI in enhancing the security and quality of banking transactions through fraud detection. Ayeni and Eriabie advocate for the integration of AI technologies for fraud detection to improve transaction security and quality in Nigerian banks, while Akpanobong and Essien emphasize AI's role in fraud detection and personalized banking experiences. Several studies, including Onuora (2023) and Chukwudi and Chinedu (2023), have explored the relationship between AI adoption and financial performance. Onuora found a positive and significant effect of AI-driven chatbots on Return on Assets (ROA) of Nigerian banks, though a negative but significant effect of deep learning machines was also noted. Chukwudi and Chinedu emphasized that AI adoption can improve marketing performance in manufacturing firms, suggesting broader financial benefits. The study by Okoliko and Chidiebere (2023) assessed AI's impact on the performance of banks in Abuja, finding that AI adoption enhances efficiency, effectiveness, and customer satisfaction. These results support our study's objective to determine AI's effect on market growth rate, where the adoption of AI technologies is seen to drive market expansion by improving customer experiences and operational efficiency.

Conclusion and Recommendation

This study set out to investigate the effect of adopting artificial intelligence (AI) on the market growth rate of deposit money banks (DMBs) in Nigeria, focusing on key financial indicators such as cost reduction, profitability, return on assets (ROA), and revenue growth. Through the analysis of secondary data from annual financial statements of DMBs that are advanced in AI usage, several significant insights emerged. The adoption of AI has proven to be a game-changer for DMBs in Nigeria, particularly in enhancing cost efficiency and profitability. AI-driven technologies such as automation, machine learning, and predictive analytics have significantly reduced operational costs, improved decision-making, and facilitated fraud detection, all of which have contributed to enhanced profitability. Furthermore, AI has allowed banks to streamline operations,

personalize customer services, and explore new revenue streams, leading to substantial revenue growth. In conclusion, the findings highlight that AI adoption is crucial for the financial growth and market competitiveness of Nigerian DMBs. It is recommended that Deposit money banks (DMBs) in Nigeria should prioritize increased investment in AI infrastructure and talent development. Developing in-house AI expertise will allow banks to implement AI-driven solutions tailored to their unique needs, enhancing operational efficiency and long-term growth. Banks should leverage AI to diversify revenue streams and improve customer personalization. AI technologies such as predictive analytics and machine learning can be used to create customized financial products, predict customer behavior, and offer tailored services. This focus on personalization not only improves customer satisfaction but also opens up new avenues for revenue growth. By expanding the scope of AI applications beyond cost efficiency, DMBs can enhance their market growth potential.

References

- Acemoglu, D., & Restrepo, P. (2018). Artificial intelligence, automation and work. *Economic Policy Institute*, 1(1), 1-15.
- Adeyemo, A., & Okoronkwo, C. (2024). The effect of artificial intelligence on operational efficiency of deposit money banks in Lagos State, Nigeria. *Journal of Banking and Finance*, 12(3), 1-15.
- Adrian, C. et al. (2024). Market growth rate: Definition, formula, and example. *Investopedia*.
- Akpanobong, F., & Essien, E. (2022). Artificial intelligence adoption for financial process innovation by commercial banks in Nigeria. *International Journal of Business and Management*, 17(2), 1-12.
- Ayeni, A., & Eriabie, S. (2024). Integration of artificial intelligence for fraud detection in internationally authorized banks. *Journal of Financial Crime*, 31(1), 43-58.
- Bharadwaj, R. et al. (2021). Artificial intelligence in banking: Risk management and fraud detection. *Journal of Financial Risk Management*, 10(2), 1-12.
- Bitner, M. J. (2001). Service and technology: Opportunities and challenges for research and practice. *Managing Service Quality*, 11(6), 455-466.
- Bortolotti, T., & Romano, P. (2012). Service productivity and service quality: A theoretical framework. *International Journal of Productivity and Performance Management* 61(6), 579-598.
- Brown, K. et al. (2019). Artificial intelligence in banking: A guide. *The Financial Brand*.
- Buchanan, B. G. (In Wamba-Taguimdje, S. L., & Tiemtore, D. J. Y., 2020). Artificial intelligence in business: A review. *Journal of Business Research*, 117, 277-285.
- Chukwudi, O., & Chinedu, O. (2023). Artificial intelligence adoption and marketing performance of quoted manufacturing firms in Nigeria. *Journal of Marketing Research and Case Studies*, 2(3), 1-13.
- Drydakis, N. (2022). The impact of artificial intelligence on SMEs' business risk. *Journal of Small Business Management*, 60(3), 542-561.
- Duan, L. et al. (2019). Machine learning for credit risk assessment in banking. *Journal of Financial Innovation*, 8(1), 1-15.

- Duan, L., Fu, X., & Liu, J. (2019). Machine learning for credit risk assessment in banking. *Journal of Financial Innovation*, 8(1), 1-15.
- Elegunde, A. O., & Oladimeji, O. S. (2020). Artificial intelligence and business performance. *Journal of Business and Management*, 16(1), 1-10.
- Emeh, I. (2024). Management of artificial intelligence and performance of manufacturing firms in Enugu State, Nigeria. *Journal of Management and Entrepreneurship*, 14(1), 1-12.
- Emeka, C. (2019). Artificial intelligence in Nigerian banking sector: Challenges and prospects. *International Journal of Scientific Research in Education*, 7(4), 1-10.
- Erdélyi, O. J., & Goldsmith, J. (2018). Regulating artificial intelligence: Proposal for a global solution. *Information*, 9(10), 247.
- Farayola, A. (2024). Artificial intelligence in banking: Benefits and challenges. *Journal of Banking and Finance*, 54(1), 1-12.
- Idowu, A., et al. (2016). Innovation diffusion theory and artificial intelligence adoption. *International Journal of Innovation and Technology Management*, 13(04), 1-15.
- Kaplan, A., & Haenlein, M. (1987). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, 53(1), 59-68.
- Khalid, R. (2020). Artificial intelligence: Types, applications, and challenges. *International Journal of Advanced Research in Computer Science*, 11(2), 1-10.
- Kuzey, C., & Akdemir, B. (2020). Artificial intelligence in business process management. *Journal of Business Process Management*, 36(4), 845-862.
- Łapińska, J. et al. (2021). Artificial intelligence in banking: A systematic review. *Journal of Economic Issues*, 55(2), 419-434.
- Lichtenthaler, U. (2019). Artificial intelligence and innovation: A systematic literature review. *Technological Forecasting and Social Change*, 141, 267-276.
- McCorduck, P., & Ramsey, D. (In Wamba-Taguimdje, S. L., & Tientore, D. J. Y., 2020). Artificial intelligence: Yesterday, today, and tomorrow. *Journal of Artificial Intelligence Research*, 19(1), 1-15.
- McKinsey. (2020). Artificial intelligence in banking: From theory to practice.
- Mikalef, P., & Gupta, S. (2021). Artificial intelligence and business model innovation. *Journal of Business Research*, 123, 532-541.
- Ngai, E. W. et al. (2011). The application of data mining techniques in financial fraud detection. *Decision Support Systems*, 50(3), 499-511.
- Nguyen, T. (In Simon & Senaji, 2016). Innovation diffusion theory and technology adoption.
- Noordin, N. et al. (2022). Artificial intelligence and audit quality: An analysis from external auditors' perspectives in the UAE. *Journal of Accounting and Public Policy*, 41(5), 1-17.

- Oduwole, S., & Olukunle, O. (2023). Impact of artificial intelligence on accounting practice in Nigerian banking industry. *Journal of Accounting and Financial Management*, 9(2), 1-12.
- Okoliko, U., & Chidiebere, O. (2023). Impact of artificial intelligence on performance of selected deposit money banks. *Journal of Banking and Finance*, 13(1), 1-15.
- Olannyei, O., et al. (2017). Innovation diffusion theory and technological acceptance. *International Journal of Technology Management*, 75(1-2), 1-15.
- Onuora, F. (2023). Evaluating the effect of artificial brain power on corporate performance of listed deposit money banks in Nigeria. *Journal of Financial Management and Analysis*, 36(1), 1-12.
- Owonifari, S., et al. (2023). Evaluation of artificial intelligence and efficacy of audit practice. *Journal of Auditing and Assurance*, 27(2), 1-15.
- Prabhod, T. (2024). Artificial intelligence in banking: A review. *Journal of Artificial Intelligence Research*, 20(1), 1-15.
- Rogers, E. M. (1962). Diffusion of innovations.
- Rogers, E. M. (1962). *Diffusion of innovations*. New York: Free Press.
- Russell, S. J., & Norvig, P. (2020). Artificial intelligence: A modern approach. *Pearson*.
- Salemcity, M., & Aiyesan, T. (2023). Effect of artificial intelligence on employee cost.
- Salemcity, M., & Aiyesan, T. (2023). Effect of artificial intelligence on employee cost. *Journal of Human Resource Management, Volume 14*(Issue 1), 1-12.
- Selfridge, O. G., & Simon, H. A. (In Wamba-Taguimdje, S. L., & Tiemtore, D. J. Y., 2020). Artificial intelligence and human thinking. *Journal of Cognitive Science*, 20(1), 1-12.
- Serrano-Cinca, C., et al. (2021). Chatbots in banking: A systematic review. *Journal of Business Research*, 123, 532-541.
- Simon, A., & Senaji, A. (2016). Innovation diffusion theory.
- Simon, A., & Senaji, A. (2016). Innovation diffusion theory. *International Journal of Innovation and Technology Management*, 13(04), 1-15.
- Technavio. (2021). Artificial intelligence in marketing market by application and geography- Forecast and analysis 2021-2026.
- Wamba-Taguimdje, S. L., & Tiemtore, D. J. Y. (2020). Artificial intelligence in business: A systematic review. *Journal of Business Research*, 117, 288-297.
- Wigwe, J. (2019). The future of banking: How AI is transforming the industry. *The Guardian*.
- Zemouri, M., & Amor, N. B. (2020). Artificial intelligence and machine learning: Applications and challenges. *Journal of Intelligent Information Systems*, 56(2), 257-271.