ARTIFICIAL INTELLIGENCE (AI) AND BUSINESS ENHANCEMENT IN NIGERIA: A CASE STUDY OF THE NIGERIAN BANKING SECTOR

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ABSTRACT

This study investigates the relationship between Artificial Intelligence (AI) adoption and business enhancement in Nigerian banking, focusing on operational efficiency, decision-making processes, customer satisfaction, and business growth. A survey research design was employed, collecting data from 354 employees across five selected banks in Imo and Abia States (First Bank of Nigeria, United Bank for Africa, Guaranty Trust Bank, Access Bank, and Zenith Bank Plc). Contrary to expectations, the findings reveal no significant relationships between AI adoption and the examined business enhancement metrics. However, the study provides valuable insights into AI adoption in Nigerian banking and highlights areas for improvement. The results inform bank managers, policymakers, and stakeholders on the need to prioritize AI adoption, invest in AI-powered customer service solutions, and establish clear regulatory guidelines. Future

Introduction

Intelligence refers to the ability to learn and apply suitable techniques to solve problems and achieve goals in an uncertain, ever-changing world (Christopher, 2020). Artificial Intelligence (AI), coined by John McCarthy in 1955, is defined as "the science and engineering of making intelligent machines" (Nilsson, 2009). Initially, Artificial Intelligence (AI) research focused on programming machines to exhibit intelligent behavior, such as playing chess, solving complex mathematical problems, and recognizing patterns. However, contemporary AI emphasizes machine learning, enabling machines to learn similarly to

research should explore challenges and opportunities for AI adoption in Nigerian banking.

h umans, albeit with limitations (Christopher, 2020). The concept of Artificial Intelligence (AI) dates back to ancient mythology, where automatons were believed to have true brains and thinking capabilities (Christopher, 2020). The term "Artificial Intelligence" was first publicly used in 1956 at Dartmouth College, marking the beginning of AI research (Nilsson, 2009). Researchers from various fields have contributed to AI, including business management, computer science, social science, engineering, and cognitive psychology (Nahodil, 2021). The global Artificial Intelligence (AI) market has grown significantly, with $24.0 billion spent in 2018 and projected to reach $77.6 billion by 2022 (IDC, 2019).

Artificial Intelligence (AI) has been discussed since the 1950s, but recent advancements in technologies such as deep learning, image recognition, machine learning, natural language processing, and robotics have brought it to the forefront (Haenlein & Kaplan, 2019; Davenport, 2018; Saravanan, 2017). AI is expected to transform business activities, similar to the impact of digitalization on human activities (Gbadegeshin, 2019). Scientists are working on making AI emotionally, cognitively, and socially intelligent, enabling machines to interact with humans more effectively (Haenlein & Kaplan, 2019).

The Nigerian banking industry plays a vital role in Nigeria's economic development, providing financial services to individuals, businesses, and governments. The industry's stability and efficiency are crucial for promoting economic growth, employment, and poverty reduction. However, the industry faces numerous challenges, including operational inefficiencies, ineffective decision-making processes, low customer satisfaction levels, and suboptimal business operations. Despite efforts to address these challenges, the industry continues to grapple with inefficiencies, poor decision-making, and low customer satisfaction (Ovia, 2005; Sanusi, 2010; Adeyeye, 2012; Okoye, 2015).

The emergence of Artificial Intelligence (AI) presents an opportunity for banks to enhance their business operations. Artificial Intelligence (AI) can improve

operational efficiency, decision-making processes, customer satisfaction, and business optimization by automating routine tasks, enhancing data analytics, and providing personalized services (Bharadwaj et al., 2013; Ross et al., 2017). However, the extent to which AI adoption influences these areas in Nigerian banks remains unclear (Al-Shammari, 2018; Jaiyeoba, 2020).

This study investigates AI's impact on business enhancement in Nigeria's banking sector, focusing on five commercial banks: First Bank of Nigeria, United Bank for Africa, Zenith Bank, Guaranty Trust Bank, and Access Bank. Specifically, this study assesses AI's potential in enhancing decision-making, and customer satisfaction in the Nigerian banking industry.

Statement of the Problem

The Nigerian banking industry faces numerous challenges, including operational inefficiencies, ineffective decision-making processes, low customer satisfaction levels, and suboptimal business operations, as noted by researchers such as Ovia (2005) and Sanusi (2010). These challenges have led to increased costs, reduced competitiveness, and decreased customer loyalty, according to studies by Adeyeye 2012; Okoye (2015). The emergence of Artificial Intelligence (AI) presents an opportunity for banks to enhance their business operations, as observed by Bharadwaj et al. (2013) and Ross et al. (2017). However, the extent to which Artificial Intelligence (AI) adoption influences operational efficiency, decision-making processes, customer satisfaction, and business optimization in Nigerian banks remains unclear, as highlighted by Al-Shammari (2018) and Jaiyeoba (2020). This study seeks to address the following pressing issues in the Nigerian banking industry. Inefficient operational processes, as identified by Harris et al. (2019), lead to increased costs and reduced competitiveness, thereby undermining the industry's overall performance. Inadequate decision-making processes result in poor strategic choices that can have long-term consequences for banks, as noted by Kiron et al. (2013). Low customer satisfaction levels lead to customer churn and reputational damage, ultimately affecting banks' profitability and sustainability, according to Zeithaml et al. (2017). Suboptimal business operations hinder banks' ability to respond effectively to market changes, limiting their capacity for innovation and growth, as observed by Chen et al. (2018).

This study aims to investigate the role of Artificial Intelligence (AI) in addressing these challenges, focusing on five money depositing banks in Nigeria, namely UBA,

FBN, Zenith Bank, GTB, and Access Bank, and contribute to the existing body of knowledge on Artificial Intelligence (AI) in the Nigerian banking industry.

Research objectives

The main objective of this study is to assess the role of Artificial Intelligence (AI) in enhancing business in Nigerian banking. The specific objectives includes to:

1. Investigate the influence of Artificial Intelligence (AI) Technology Infrastructure on decision-making processes in Nigerian banks.
2. Examine the relationship between Artificial Intelligence (AI) Algorithm Complexity and on decision-making processes in Nigerian banks.
3. Assess the contribution of Artificial Intelligence (AI) Algorithm Complexity on customer satisfaction levels in Nigerian banks.
4. Analyze the impact of Artificial Intelligence (AI) Technology Infrastructure on customer satisfaction levels in Nigerian banks.

Research Questions

1. How does Artificial Intelligence (AI) technology infrastructure impact decision-making processes in Nigerian banks?
2. To what extent do Artificial Intelligence (AI) algorithm complexity influence decision-making processes in Nigerian banks?
3. How does Artificial Intelligence (AI) algorithm complexity contribute to customer satisfaction in Nigerian banks?
4. What is the relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks?

Research Hypotheses

Ho_1: There is no significant relationship between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks.

Ho_2: There is no significant relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks.

$H0_3$: There is no significant relationship between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks

$H0_4$: There is no significant relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks

Conceptual Review
Conceptual Framework

The conceptual framework covers the concept of Artificial Intelligence. The concept of business enhancement and its measures (Decision-Making Processes and Customer Satisfaction) are also discussed under the conceptual framework. The operational conceptual model of the relationship between Artificial Intelligence and enhancement of business are shown in figure 1 below:
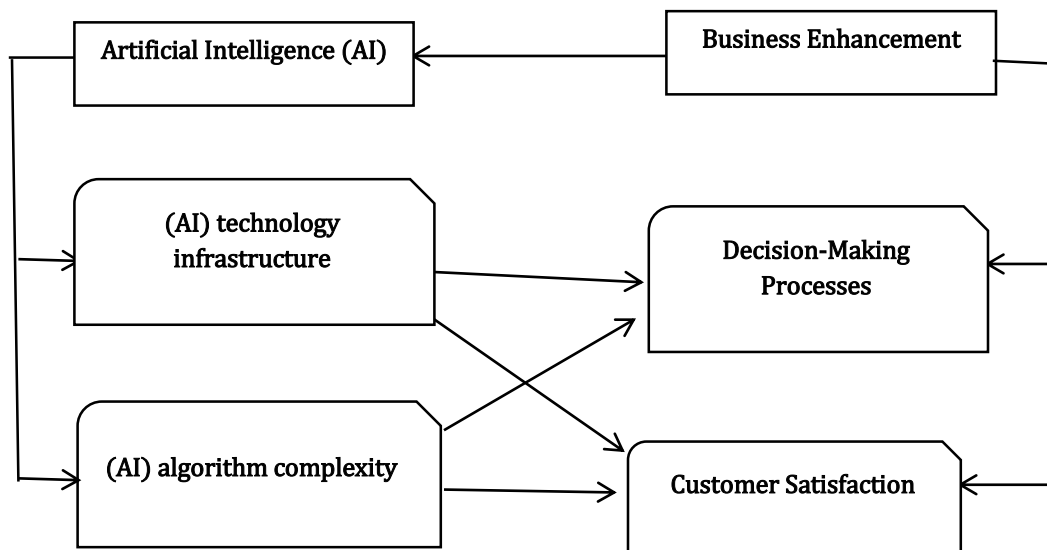

Figure 1: Operational conceptual model of the relationship between Artificial Intelligence and enhancement of Business Source: Researcher's Operationalization, 2025.

Concept of Artificial Intelligence

Artificial intelligence (AI) has been described as an intelligent system that is created to use data analysis, and observations to perform tasks without needing to be programmed to do so (Antonescu, 2018). It is also defined as the intelligence that is exhibited by an artificial entity in order to solve complex problems, and such a system is generally assumed to be a computer or machine (Borana, 2016). On their own part, Plastino & Purdy (2018) describe artificial intelligence as a category of technology which involves a capital-labour hybrid with the ability to self-learn, continuously improve, and be rapidly scaled-up.

Koutsoukis (2024) states Artificial intelligence (AI) is the theory and development of computer systems capable of performing tasks that historically required human

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intelligence, such as recognizing speech, making decisions, and identifying patterns. AI is an umbrella term that encompasses a wide variety of technologies, including machine learning, deep learning, and natural language processing (NLP). Although the term is commonly used to describe a range of different technologies in use today, many disagree on whether these actually constitute artificial intelligence. Instead, some argue that much of the technology used in the real world today actually constitutes highly advanced machine learning that is simply a first step towards true artificial intelligence, or "general artificial intelligence" (GAI) (Koutsoukis, 2024).

One of the advantages of artificial intelligence is that its decisions are based on facts and not on emotions. This comes as an advantage given that even with the utmost efforts, human decisions can be negatively affected by emotions. In addition, unlike humans, machines do not need any sleep and, as such, overcome the inherent disadvantage that comes with fatigue in human beings. As such, it enables the easier spread of knowledge given that once an artificial mind gets trained for a specific thing, it can be easily copied to others, thereby reducing the time that would have been wasted in the passing on of knowledge to other humans through training (Antonescu, 2018).

Some of the most common examples of artificial intelligence in use today include:

- **Chat-GPT:** Uses large language models (LLMs) to generate text in response to questions or comments posed to it.
- **Google Translate:** Uses deep learning algorithms to translate text from one language to another.
- **Netflix:** Uses machine learning algorithms to create personalized recommendation engines for users based on their previous viewing history.
- **Tesla:** Uses computer vision to power self-driving features on their cars.

Types of Artificial Intelligence

There four basic types of Artificial Intelligence which includes:

a. **Deep learning (DL):** is an advanced type of machine learning that consists of multiple artificial neural network layers, providing high-level abstracts for data modeling (Le Cun, Bengio & Hinton, 2015).With the introduction and popularity of Financial Technologies (FinTech) in recent years, the prevalence of the use of deep learning in finance and banking services is being embraced (Huang, Cha & Cho, 2020).

b. **Chat-bots:** The emergence of chat-bots has led to a change in the bank-customer interface and communication. Chat-bots use artificial intelligence

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tools for processing natural language, which are configured to read, process, and analyses large amounts of information (Suhel, Shukla, Vyes & Mishra, 2020). With the aid of these artificial chat-bots, people's interactions, including past conversations, are used to improve and expand databases. These chatbots work to answer unclear or ambiguous questions and can also generate responses on their own with the aid of processing technology. Chatbots' functions include retrieving knowledge to assist in providing customers with required information, especially as it regards the provision of specific products or services (Joshi, 2018).

c. **Automation:** in banking refers to the adoption of artificial intelligence in banking activities or business processes in order to increase efficiency in operations while maintaining competitiveness. Automation can be described as that arrangement whereby machines are allowed to carry out business operations and, in this case, banking functions without the interference of humans. This is accomplished by utilizing machines rather than humans in banking processes. Automation allows banks to enter and also grow in new markets.

d. **Fraud Prevention:** With the introduction of credit cards, mobile banking, and online payments in banking services, scammers have devised various means of exploiting people by stealing their information in order to use them to make unauthorized purchases and/or movements of large amounts of money. The various activities of banks and other e-commerce websites to try to identify and stop the reoccurrence of these fraudulent transactions are described as "fraud detection" (Pradheephan & El Gayar, 2019). The damage caused by fraud cannot be overemphasized. Credit card fraud, a form of fraud involving the use of fake or stolen credit card information to cause financial harm to original account holders or sellers has increased drastically in recent times. The Nilson report (2016) states that the total loss accruing from credit card fraud in the world as at 2015 was $21.84 billion, with a projected rise to $32 billion in 2020 (Nilson Report, 2016).

Artificial Intelligence Applications in Business

Nahodil, and Vıtku, (2022) states that artificial intelligence supports human intelligence and inventiveness rather than replacing it. AI can process and analyze large amounts of data quicker than a human brain, but it struggles with basic tasks. Then, AI software may offer synthesized actions to humans. Thus, AI can help us

predict the outcomes of each action and simplify decision-making. Amir Husain, creator and CEO of Spark Cognition, called artificial intelligence the second coming of software. "It's software that makes its own decisions and acts in situations the programmers didn't anticipate. AI can make more decisions than traditional software". AI is useful in numerous sectors, from helping visitors and staff navigates a corporate site to monitoring a wind turbine to forecast maintenance (Nahodil, & Vıtku, 2022).

Nahodil, and Vıtku, (2022) identified that there are several uses for artificial intelligence in business, but most of them are focused on fostering expansion. Companies are discovering novel methods to improve company performance by integrating artificial intelligence (AI) and machine learning (ML).The following is a list of some of the commercial benefits of Artificial Intelligence:

1. **Machine Learning**

   Massive data systems employ machine learning. Smart energy management systems take data from asset sensors. Machine-learning algorithms contextualize the data for your company's decision-makers to better comprehend energy use and maintenance needs.

2. **Cyber Security**

   Husain said artificial intelligence is essential for finding computer network security weaknesses. AI systems can detect cyber-attacks and other cyber threats by analyzing data trends. It may pinpoint the source of a danger in your data and prevent future threats. Your infrastructure will benefit from AI's vigilant and constant eyes. "Because of scale and increasing complexity, you really can't have enough cyber security experts to look at these problems," Husain said Artificial Intelligence is becoming more important here".

3. **Managing Customers**

   AI is also revolutionizing CRM systems. Sales force and Zoho need frequent human updates. AI turns a CRM system into a self-updating, auto-correcting relationship management system.

   - Increasing Productivity Through the Automation of Processes
   - Improving either the rate at which service is provided or its consistency.
   - Utilizing information gleaned from customers as a basis for decision-making
   - Discovering new markets for existing and potential products and services.

   The use of Artificial Intelligence is compatible with virtually any business tactic. To get started with AI, it is essential to first obtain a grasp of how data collecting and analysis factor into artificial intelligence. This is because artificial

intelligence relies heavily on data. You will be better equipped to identify how artificial intelligence could be able to aid your sector if you examine the technique underlying AI first. Anyone interested in learning more about how AI is revolutionizing the world of business might consider enrolling in an introductory AI course such as the one offered by Wharton Online's Artificial Intelligence for Business program. This can be an excellent place to start.

4. **Improving One's Service to Customers**

Have you ever gone to a website and were greeted by a chat-bot when you went there? Customers may have direct interactions with AI most frequently through chat-bots. This type of interaction is becoming increasingly widespread. Chat-bots make it possible for businesses to automate many of the procedures involved in providing customer care and free up staff' time to focus on problems that call for a higher level of individualized attention. The ability to comprehend user requests is often accomplished by chat-bots through a synergy of natural language processing, machine learning, and artificial intelligence. Clients can also be sent to a real-life employee who is better able to answer their inquiries by using chat-bot technology, which can also aid clients.

5. **Providing Suggestions for Various Products**

Artificial Intelligence may be used by businesses to provide product recommendations to clients that will both satisfy their needs and keep them interested in what they have to offer. You can provide clients with items that are comparable to those that they have already viewed on your website if you follow the behavior of your customers on your website. Companies who operate in the e-commerce market might benefit tremendously from utilizing this strategy. Streaming services provide yet another illustration of personalized suggestions in action. Streaming platforms are able to keep you on their app for longer lengths of time by showing you titles that are similar to the movies and program that you click on the most frequently. This analysis is performed by looking at the sorts of movies and shows that you click on the most.

6. **Segmenting Audiences**

In a manner not dissimilar to that of making product recommendations, advertising departments may utilize AI to divide consumers into distinct groups and develop campaigns that are specifically geared towards those groups. When working in a field that is known for its high level of competition, it is of the utmost importance to present one's work to the appropriate audience. Companies utilize data to determine which sorts of people will see which advertisements in order

to make their marketing initiatives more effective. When it comes to forecasting how clients would respond to certain adverts, artificial intelligence comes into play.

7. **Examining the Level of Happiness of the Customers**

The usage of sentiment analysis, also known as emotion artificial intelligence (AI), is a strategy that businesses employ in order to evaluate the responses of their clients. The use of artificial intelligence (AI) and machine learning allows businesses to collect data about how consumers view their brand. One example of this is the use of artificial intelligence to comb through reviews, ratings, and postings on social media platforms that reference the brand. Companies are able to find chances for improvement as a result of the insights that were gathered through this investigation.

8. **Identifying Fraud**

AI may also assist businesses in identifying potential instances of fraud and devising effective countermeasures. Utilizing various types of machine learning algorithms, there are already accessible solutions in the banking and finance sector that can identify potentially fraudulent transactions. The application will prevent the transaction from going through if it determines that there is a potential for fraud and will notify the relevant parties.

9. **Increasing Efficiency throughout the Supply Chain Activities**

AI could be able to assist your firm if it has trouble meeting its deadlines for the delivery of its products on a regular basis. AI-driven solutions may be of assistance to businesses in several ways, including anticipating how quickly items will be able to move through the supply chain and predicting the cost of materials and shipping. These kinds of insights provide supply chain experts with the information they need to make decisions on the most efficient manner to distribute their items. On a more localized basis, artificial intelligence may be utilized to assist delivery trucks in locating speedier routes.

10. **Financial and Banking Services**

The emergence of Artificial Intelligence applications has caused a significant upheaval in the banking and financial services sector. There are tons of AI application cases in this field. In many cases, sophisticated software robots are replacing human workers to handle loan applications in milliseconds. Similar to this, robo-financial advisers quickly sort through several levels of data to suggest the best investments for clients. In order to find the industries and businesses most closely associated with your long-term requirements and aspirations, these

Robo-advisors can also analyze your social media activity, emails, and other personal data. In order to enhance the customer experience and develop insurance plans and solutions based on consumer data, AI-based chat-bots are also being used in the insurance industry. The processing of claims has been sped up greatly thanks to the introduction of AI-based tools, benefiting both customers and insurance providers. Fraud detection is a crucial use of AI in the banking industry. For instance, Master-card analyses multiple data points to identify fraudulent transactions using AI-based Decision Intelligence technology.

Decision-making Process

The evolution of Artificial Intelligence (AI) in decision-making has been marked by several significant milestones. In the early days, AI applications were limited to expert systems that relied on predefined rules to simulate human decision-making. These systems were effective for well-defined tasks but lacked the flexibility and learning capabilities of modern AI. The advent of machine learning in the late 20th century marked a paradigm shift. Algorithms such as decision trees, support vector machines, and neural networks began to outperform traditional statistical methods in many applications (Russell & Norvig, 2016). More recently, deep learning has revolutionized the field by enabling AI systems to process unstructured data, such as images and speech, with remarkable accuracy (LeCun, Bengio, & Hinton, 2015).

Today, AI's role in decision-making continues to expand. Organizations across various sectors are leveraging AI to automate routine tasks, optimize processes, and enhance strategic decision-making. For instance, AI-driven customer relationship management (CRM) systems analyze customer interactions to provide personalized recommendations, thereby improving customer satisfaction and loyalty (Nguyen & Mutum, 2012). AI offers numerous benefits in decision-making, primarily through its ability to handle and analyze vast amounts of data quickly and accurately. This capability leads to several key advantages:

Enhanced Data Analysis Capabilities: AI systems can process and analyze large datasets far more efficiently than human analysts. This capability is particularly valuable in fields such as finance, where AI algorithms analyze market trends and historical data to inform investment strategies (Bose, 2020). Similarly, in healthcare, AI-driven diagnostic tools analyze medical images and patient records, aiding clinicians in making accurate diagnoses (Topol, 2019).

Customer Satisfaction Levels

Artificial Intelligence assimilation has become a crucial component in modern business and customer service landscapes. The integration of AI technology into customer service brings several benefits, such as enhancing customer experience, reducing wait times, and improving efficiency in handling issues (Bughin et al., 2018). AI can assist customers by providing accurate and relevant information, resolving simple queries, and referring to complex issues for human agents. The use of this technology in customer service also helps businesses reduce their operational costs by decreasing their reliance on human agents. This phenomenon is rapidly evolving in the current digital era, with widespread AI implementation across various sectors ranging from production automation to customer service.

Artificial Intelligence assimilation has brought significant benefits to human life (McIntosh et al., 2014; Sarstedt et al., 2022). First, Artificial Intelligence enhances efficiency and productivity. AI's ability to swiftly and accurately analyze data can assist humans in making more precise decisions (Astuti and Pratika, 2019). Furthermore, AI can be used to automate production processes, reduce human fatigue, and improve product quality (Astuti & Pratika, 2019).

Second, Artificial Intelligence helps humans handle tasks that are difficult or impossible to perform. AI can be utilized in disaster response contexts, such as locating victims trapped under building rubble, or in medical data analysis for disease detection in patients (Hulliyah, 2021; Liengaard et al., 2021; Rönkkö et al., 2016; Sarstedt et al., 2021).

Theoretical Framework

This study is anchored on Integrates with Organizational Learning Theory (OLT)

Integration with Organizational Learning Theory (OLT)

Organizational Learning Theory (OLT), developed by Chris Argyris and Donald Schön, provides a comprehensive framework for understanding how organizations learn and adapt (Argyris & Schön, 1978). At its core, OLT emphasizes the importance of individual and group interactions in driving organizational learning. It also emphasizes the importance of organizational learning and adaptation in responding to changing environments. AI adoption can facilitate organizational learning by enhancing operational efficiency, decision-making processes, and customer satisfaction.

According to Argyris and Schön, individuals construct their own representation of the organization, which they term "theory-in-use" (Argyris & Schön, 1978). This implicit, context-specific understanding of organizational operations is shaped by shared descriptions of the organization, or "organizational maps," constructed jointly by individuals.

OLT identifies two primary types of learning: single-loop and double-loop learning. Single-loop learning involves correcting errors within existing frameworks, whereas double-loop learning questions and modifies underlying assumptions and norms (Argyris & Schön, 1978). Additionally, OLT distinguishes between Model I and Model II learning. Model I learning is defensive, rigid, and self-fulfilling, while Model II learning is open, flexible, and reflective (Argyris, 1982).

Argyris and Schön also describe two types of organizational learning systems: O-I (Organizational I) and O-II (Organizational II). O-I systems are defensive and self-reinforcing, inhibiting deeper learning, whereas O-II systems are productive and learning-oriented (Edmondson & Moingeon, 1999). The OLT process involves individuals constructing their own representation of the organization, followed by organizational learning through joint construction of maps. Single-loop learning maintains existing norms, while double-loop learning challenges and modifies norms. Model I learning creates O-I systems, while Model II learning enables O-II systems.

Empirical Review

Jaiyeoba, (2020) empirically examined Artificial Intelligence and Employee Performance in the Nigerian Banking Industry, Lagos Nigeria. The study adopted the cross-sectional descriptive research design was adopted by the researcher. Primary data was to elicit information for this study. The population of the study was the entire employees of six (6) selected banks operating in Lagos State, Nigeria, which totaled 127 staff. The researchers adopted Taro Yamane (1967) sample size determinant to arrive at a sample size of 98 elements. 98 copies of questionnaires were administered to respondents of six banks in Lagos State, Nigeria, which was divided using simple proportion and ratio among the six banks, 98 respondents were used for data analysis. Content validity was adopted for this study. Reliability test was conducted using Cronbach Alpha and it returned 0.773 showing internal consistency of research instrument. Descriptive statistics such as mean, simple percentage was used to analyze the demography of respondents while regression and Pearson correlation coefficients were used to analyze data. The findings revealed

that Artificial Intelligence complements work process in banks in Nigeria and that machine-aided tasks ease operations in banks in Nigeria. The study recommended the adoption of AI by not only banks but all other firms in the service industry; the need for all employees and people to be educated on the importance of embracing AI; the upgrading of school curriculum at all levels in developing and third world economies to incorporate AI and its accompanying gadgets.

Adeyeye (2019) empirically examined a critical question from customers' perspective: Does quality of bank services lead to customer satisfaction in the Nigerian banking sector? The study was conducted using questionnaire survey administered in Nigeria using customers of some selected banks as sample. The researcher used primary data collected through scientifically developed questionnaires, which were administered on 174 bank customers selected on a convenient basis. The results, based on factor and regression analysis, identified four factors that impact customers' assessment of the quality of banking services including responsiveness, reliability, tangibility and empathy respectively. The implication of the finding is to enhance the understanding of bank managers and other relevant stakeholders of customers' perception of the quality of banking services and consequently reveal the path to developing strategies for improving their satisfaction.

Felicia & Grace (2024) carried out a study to determine the effect of Artificial Intelligence (AI) on the operational efficiency of deposit money banks in Lagos State, Nigeria. The study adopted a survey research design. Copies of the questionnaire were administered to 450 regular employees selected randomly from the five banks. The study revealed that deep learning ($\beta = 0.400$, $t = 5.445$, $p<0.05$); Automation ($\beta = 0.202$, $t = 2.143$, $p<0.05$) and fraud detection ($\beta = 0.460$, $t = 7.095$, $p<0.05$) had positive and significant effects on the operational efficiency of the selected deposit money banks, while chatbots had a positive but insignificant effect. The study concluded that artificial intelligence significantly contributed to the operational efficiency of the selected deposit money banks in Nigeria.

Methodology

The analysis is based on a survey research design, utilizing dual data collection tools: online structured questionnaires and virtual interviews, targeting banking professionals from five selected banks in Imo and Abia State in Nigeria (the online structured questionnaires and virtual interviews provide triangulation, enhancing data validity and reliability). This study adopted the cross-sectional survey research design.

The population of the study comprised regular employees of the selected five deposit money banks from Imo and Abia States Nigeria (i.e. First Bank of Nigeria Plc, United Bank of Africa, Guaranty Trust Bank, Access Bank, and Zenith Bank Plc). According to the Nigerian Banker (2020), these deposit money banks are referred to as FUGAZ deposit money banks, and they also represent the Tier 1 deposit money banks that have been considered too big to fail. The population figure is given as 3,098 employees of the selected deposit money banks. The table below gives a summary of the population size for each bank.

Table 1 Bank Employee Staff Strength

Name of Organization	No. of Employees	Percentage
First Bank of Nigeria Plc,	756	24.5%
United Bank of Africa,	726	23.5%
Guaranty Trust Bank	587	18.9%
Access Bank	326	10.5%
Zenith Bank Plc	703	22.6%
Total	3,098	100

Sources: *FBN Annual Reports: 2025, UBA Annual Reports, Zenith Bank Annual Financial Bulletin: 2023, GTB Annual reports 2023 & Access Bank Financial Bulletin: 2025.*

The study utilized a sample size of 354 employees, randomly selected from branches of the five banks in Imo and Abia States: First Bank of Nigeria Plc, United Bank of Africa, Guaranty Trust Bank, Access Bank, and Zenith Bank Plc. The sample size was determined using Taro Yamane's formula to ensure representativeness and accuracy.

$$n = \frac{N}{1 + N\,(e)^2}$$

Where n = Sample size sought

N = Population (3,098)

e = Level of significance (5%)

The sample size sought (n) is:

$$n = \frac{3,098}{1 + \mathbf{3,098}\,(0.05)^2}$$

n = $\dfrac{3,098}{8.745}$

n = 354

Following sample size determination, this study employed a non-probability sampling approach, specifically purposive sampling, to select participants from the study population. Critical case sampling, a subtype of purposive sampling, was utilized to identify information-rich cases. Additionally, systematic sampling was applied to select staff respondents across various job positions, including management, senior, intermediate, and junior levels.

Table 2: Sample Size Allocation by Bank (FUGAZ)

Name of Organization	No. of Employees	Percentage
First Bank of Nigeria Plc,	87	24.5%
United Bank of Africa,	83	23.5%
Guaranty Trust Bank	67	18.9%
Access Bank	37	10.5%
Zenith Bank Plc	80	22.6%
Total	354	100

Source: Field Survey 2025

Table 2 descriptive narrative shows the sample size of 354 employees was strategically allocated across the selected banks, where First Bank of Nigeria had 87 respondents representing 24.7%, United Bank of Africa had 83 respondents representing 23.4%, Guaranty Trust Bank had 67 respondents representing 18.9%, Access Bank had 37 respondents representing 10.4% and Zenith Bank Plc had 80 respondents representing 22.6%.

Table 3 Sample Size Allocation (questionnaire distribution) by Staff Level

Name of Organization	No. of Employees/respondent			
	Management	Senior	Intermediate	Junior
First Bank of Nigeria Plc,	9	17	35	26
United Bank of Africa,	8	17	33	25
Guaranty Trust Bank	7	13	27	20
Access Bank	4	7	15	11
Zenith Bank Plc	7	17	32	24
Total	35	71	142	106
Percentages/respondent level	10%	20%	40%	30%

Table 3 descriptive narrative shows that Management had total 35 respondents a 10% proportion representing senior leadership, this group comprised 9 employees from First Bank, 8 from UBA, 7 from GTB, 4 from Access, and 7 from Zenith. Senior had total 71 respondents a 20% proportion representing senior leadership: This level included experienced professionals, with 17 employees from First Bank, 17 from UBA, 13 from GTB, 7 from Access, and 17 from Zenith. Intermediate had total 142 respondents a 40%, proportion representing senior leadership: This mid-level group consisted of 35 employees from First Bank, 33 from UBA, 27 from GTB, 15 from Access, and 32 from Zenith. Junior had total 106 respondents a 30% proportion representing senior leadership (n=): Entry-level and junior staff comprised 26 employees from First Bank, 25 from UBA, 20 from GTB, 11 from Access, and 24 from Zenith.

Data Presentation, Analysis and Discussion of Findings
Data Presentation

In this section, the researcher presented the data collected in the questionnaire. A total of three hundred and fifty four (354) copies of questionnaire were administered to the different levels of staff/respondents of the selected. The different level of staff includes Management, senior, intermediary and junior staff. The order in which the questionnaires were distributed to the respondents and the collection rate is presented in table 4 below:

Table 4: Questionnaire Administration and Collection

Respondents (Employees)	Questionnaires	
	No. Distributed	Percentage
Management	35	100%
Senior	71	100%
Intermediate	142	100%
Junior	106	100%
Total	354	100%

Source: Field Survey, 2025.

Table 4 shows the questionnaires distributed to the respondents and the collection rate. From the table, it is observed that out of the 354 questionnaires distributed to the respondents, 35 electronic Google questionnaires were emailed to management respondent and all the completed online Google questionnaire was received which

represents 100% collection rate. Meanwhile, 71 electronic Google questionnaires were emailed to senior respondent and all the completed online Google questionnaire was received which represents 100% collection rate. However, 142 electronic Google questionnaires were emailed to intermediate respondent and all the completed online Google questionnaire was received which represents 100% collection rate; while 106 copies were assigned to Junior staff and all copies were received from them which represents 100% collection rate electronic Google questionnaires were emailed to junior respondent and all the completed online Google questionnaire was received which represents 100% collection rate. On the whole, 354 electronic questionnaires were distributed and received from the entire staff that forms the sample size.

Data Analysis

In this section, the data collected in the questionnaire were analyzed statistically. Here, the researcher analyzed the demographic data of the respondents who participated in this study as well as their responses received to the study variables. The results of the analysis carried out were interpreted and used to provide answers to the research questions and hypotheses.

Demographic Analysis

The demographic data of the respondents (retailers) who participated in this study were presented and analyzed statistically. The demographic analysis focused on the respondents' gender, marital status, age bracket, department, position/status, length of service and educational qualification.

Table 5: Gender of the Respondents

Gender	Frequency	Percentage
Male	153	43%
Female	201	57%
Total	354	100%

 Source: Field Survey, 2025.

Table 5 shows the gender of the respondents who completed and returned the questionnaire. From the table, it is observed that out of the 354 who participated in this study, 153 of them representing 43% of the respondents were male staff while 201 of them representing 57% of the respondents were female staff.

Table 6: Years in Service

Years in Business	Frequency	Percentage
1-5 years	50	14.2%
6 – 10 years	71	20%
11 – 15 years	70	19.7%
16 – 20 years	88	24.9%
21 years and Above	75	21.2%
Total	354	100%

Source: Field Survey, 2025

Table 6 depicts the number of years that the respondents (employees) have been in service. As observed in the table, 50 of the employees have put in service for 1-5 years representing 14.2%; 71 of the staff have put in service for 6-10 years representing 20%; 70 of the employees have put in service for 11-15 years representing 19.7%; 88 of the employees have put in service for 16-20 years representing 24.9%; while 75 of the employees have put in service for 21 years and above representing 21.2%.

Table 7: Highest Academic Qualification of the Respondents

Academic Qualifications	Frequency	Percentage
SSCE/NECO/GCE holder	36	10.2%
N.D./N.C.E. holder	53	15.0%
B.Sc./B.Ed./B.A./H.N.D. holder	212	59.9%
M.Sc./M.Ed./M.A./M.B.A. holder	42	11.9%
Ph.D	10	2.8%
Total	354	100%

Source: Field Survey, 2025

Table 7 presents the highest academic qualification of the respondents (employees) who completed and returned the questionnaire. The table shows that out of the 354 employee who participated in this study, 36 of them representing 10.2% of the respondents were SSCE/NECO/GCE holders; 53 employees representing 15% of the respondents were N.D./N.C.E. holders; 212 employees representing 59.9% of the respondents were B.Sc./B.Ed./B.A./H.N.D holders; 42 employees representing 11.9% of the respondents were M.Sc./M.Ed./M.A./M.B.A holders; while 10 employees representing 2.8% of the respondents were Ph.D holders.

Univariate Analysis

The responses received from the respondents were analyzed in this section. The analysis focused on the data collected on the study variables. The responses received from the respondents were converted to mean and the mean scores were used to analyze the data collected on the study variables.

Table 8: Mean responses of employees on (AI) technology infrastructure and decision-making processes in Nigerian banks.

S/No	ITEMS	SA 5	A 4	N 3	D 2	SD 1	Grand Total	Mean $\overline{X}$	Crit. Mean	Decision
1.	Artificial Intelligence (AI) technology infrastructure has improved decision making processes in Nigerian banks	81	150	3	41	14	354	3.69	3.50	Accepted
2.	Artificial Intelligence (AI) technology infrastructure has improved the speed of transaction processing in Nigerian banks.	78	173	66	27	10	354	3.82	3.50	Accepted
3.	Artificial Intelligence (AI) technology infrastructure has reduced errors in decision making processes.	75	170	67	28	14	354	3.75	3.50	Accepted

Source: Field Survey, 2025.

Table 8 shows the mean responses of employee's Artificial Intelligence technology infrastructure influence on decision making processes in Nigerian the banks. From the table, it is observed that the mean responses of employee's are greater than the criterion mean of 3.50 which implies that most of the respondents agreed with the items listed in the table. The mean scores for all three items are above the critical mean value, indicating that these items are accepted. The results indicate that the majority of respondents agree that AI technology infrastructure has improved decision-making processes, speed of transaction processing, and reduced errors in decision-making processes in Nigerian banks.

Table 9: Mean responses of employee's Artificial Intelligence algorithm complexity and decision-making processes in Nigerian banks

S/No	ITEMS	SA 5	A 4	N 3	D 2	SD 1	Grand Total	Mean X	Crit. Mean	Decision
1.	Artificial Intelligence (AI) algorithm complexity has enhanced decision-making processes in Nigerian banks.	75	170	67	28	14	354	3.75	3.50	Accepted
2.	Artificial Intelligence (AI) algorithm complexity has improved data analysis for decision-making	72	183	66	23	10	354	3.82	3.50	Accepted

S/No	ITEMS	SA 5	A 4	N 3	D 2	SD 1	Grand Total	Mean X	Crit. Mean	Decision
3.	Artificial Intelligence (AI) algorithm complexity has enabled real-time monitoring and reporting	81	200	50	17	6	354	3.94	3.50	Accepted

Source: Field Survey, 2025.

Table 9 shows the mean responses of employee's Artificial Intelligence algorithm complexity and decision-making processes in Nigerian banks. From the table, it is observed that the mean responses of employee's are greater than the criterion mean of 3.50 which implies that most of the respondents agreed with the items listed in the table. Technology infrastructure has improved decision-making processes, speed of transaction processing, and reduced errors. AI algorithm complexity has enhanced decision-making processes, improved data analysis, and enabled real-time monitoring and reporting.

Table 10: Mean responses of employee's Artificial Intelligence algorithm complexity on customer satisfaction in Nigerian banks

S/No	ITEMS	SA 5	A 4	N 3	D 2	SD 1	Grand Total	Mean $\overline{X}$	Crit. Mean	Decision
1.	Artificial Intelligence (AI) algorithm complexity has positively impacted customer satisfaction levels in Nigerian banks	72	183	66	23	10	354	3.80	3.50	Accepted
2.	Artificial Intelligence (AI) algorithm complexity has improved customer complaint resolution time	81	200	50	17	6	354	3.94	3.50	Accepted
3.	Artificial Intelligence (AI) algorithm complexity has enabled real-time monitoring and reporting	81	200	50	17	6	354	3.94	3.50	Accepted

Source: Field Survey, 2025.

Table 10 shows the mean responses of employee's adoption of Artificial Intelligence on customer satisfaction levels in Nigerian banks. From the table, it is observed that the mean responses of employee's are greater than the criterion mean of 3.50 which implies that most of the respondents agreed with the items listed in the table. he

results suggest that employees in Nigerian banks believe that AI algorithm complexity has improved customer satisfaction levels, complaint resolution time, and enabled real-time monitoring and reporting. This indicates that AI has had a positive impact on customer satisfaction in Nigerian banks.

Table 11: Mean responses of employee's on Artificial Intelligence (AI) technology infrastructure and customers satisfaction in Nigerian banking

S/No	ITEMS	SA 5	A 4	N 3	D 2	SD 1	Grand Total	Mean $\overline{X}$	Crit. Mean	Decision
1.	Artificial Intelligence (AI) technology infrastructure is effective in Nigerian banking.	81	200	50	17	6	354	4.01	3.50	Accepted
2.	Artificial Intelligence (AI) technology infrastructure has improved customers satisfaction level	81	200	50	17	6	354	4.02	3.50	Accepted
3.	Artificial Intelligence (AI) technology infrastructure has enabled for customers services.	79	210	45	15	5	354	4.04	3.50	Accepted

Source: Field Survey, 2025.

Table 11 shows the mean responses of employee of Artificial Intelligence technological infrastructure and customer's satisfaction in Nigerian banking. From the table, it is observed that the mean responses of employee's are greater than the criterion mean of 3.50 which implies that most of the respondents agreed with the items listed in the table. The results suggest that AI technology infrastructure has had a positive impact on customer satisfaction in Nigerian banks, and employees have a favorable view of its effectiveness.

Testing of Hypotheses

The hypotheses formulated in section one of this studies were tested in this section. The essence of testing the hypotheses is to determine whether there is any relationship between independent and dependent variables of the study. The Spearman Rank Order Correlation Coefficient (rho) was used to test the hypotheses. The rho value for each hypothesis was calculated using the NCSS version 2024.The results of the statistical testing are presented below according to the hypotheses:

Hypothesis 1

Ho_1: There is no significant relationship between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks.

Hi₁: There is significant relationship between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks.

Table 12: Relationship between the Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks.

			(AI) technology infrastructure	decision-making processes
Spearman (rho)	decision-making processes	Correlation Coefficient	.000	0.81.**
			.	.000
		Sig. (2 tailed)	354	354
		N		
	decision-making processes	Correlation Coefficient	0.81**	.000
			.000	.
		Sig. (2 tailed)	354	354
		N		

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)
Confidence interval: 95%
Source: NCSS-Generated Output, 2025

Table 12 shows the result of the correlation analysis carried out of the relationship between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks. The result indicates that Artificial Intelligence (AI) technology have a strong positive correlation with decision-making processes in Nigerian banks (rho = 0.81**) and the symbol ** signifies that this correlation is significant at 0.01 level. Based on this result, the null hypothesis (Ho₁) is rejected and the alternate (Hi₁) is accepted. This means that we then accept that there is significant relationship between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks.

Hypothesis Two

Ho₂: There is no significant relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks.

Hi₂: There is significant relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks.

Table 13: Relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks

			(AI) algorithm complexity	decision-making processes
Spearman (rho)	(AI) algorithm complexity	Correlation Coefficient	.000	0.785.**
		Sig. (2 tailed)	.	.000
		N	354	354
	decision-making processes	Correlation Coefficient	0.785**	.000
		Sig. (2 tailed)	.000	.
		N	354	354

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)
Confidence interval: 95%
Source: NCSS-Generated Output, 2025

Table 13 shows the result of the correlation analysis carried out between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks. The result indicates that Artificial Intelligence algorithm complexity have a strong positive correlation withdecision-making in Nigerian banks (rho = 0.785**) and the symbol ** signifies that this correlation is significant at 0.01 level. Based on this result, the null hypothesis (Ho$_1$) is rejected and the alternate (Hi$_1$) is accepted. This means that there is a significant there is significant relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks.

Hypothesis Three

H0$_3$: There is no significant relationship between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks

Hi$_3$: There is no significant relationship between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks

Table 14: Relationship between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks

			(AI) algorithm complexity	customer satisfaction levels
Spearman (rho)	(AI) algorithm complexity	Correlation Coefficient	.000	0.812.**
			.	.000
		Sig. (2 tailed)	354	354
		N		
	customer satisfaction	Correlation Coefficient	0.812**	.000
			.000	.
		Sig. (2 tailed)	354	354
		N		

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)
Confidence interval: 95%
Source: NCSS-Generated Output, 2025

Table 14 shows the result of the correlation analysis carried out between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks. The result indicates that Artificial Intelligence algorithm complexity have a strong positive correlation with customer satisfaction levels in Nigerian banks (rho = 0.812**) and the symbol ** signifies that this correlation is significant at 0.01 level. Based on this result, the null hypothesis (Ho_1) is rejected and the alternate (Hi_1) is accepted. This means that there is a significant relationship algorithm complexity and customer satisfaction in Nigerian banks.

Hypothesis Four
$H0_4$: There is no significant relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks

Hi_4: There is significant relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks

Table 15: Relationship between relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks

			(AI) technology infrastructure	customer satisfaction
Spearman (rho)	(AI) technology infrastructure	Correlation Coefficient Sig. (2 tailed) N	.000 . 354	0.839.** .000 354
	customer satisfaction	Correlation Coefficient Sig. (2 tailed) N	0.839** .000 354	.000 . 354

**Correlation is significant at 0.01 levels (2 tailed)

*Correlation is significant at 0.05 levels (2 tailed)

Confidence interval: 95%

Source: NCSS-Generated Output, 2025

Table 15 shows the result of the correlation analysis carried out between relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks. The result indicates that Artificial Intelligence technology infrastructure have a very strong positive correlation with contribution to optimizing business operations in Nigerian banks (rho = 0.839**) and the symbol ** signifies that this correlation is significant at 0.01 level. Based on this result, the null hypothesis (Ho_1) is rejected and the alternate (Hi_1) is accepted. This means there is significant relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks.

Table 16: Summary of Hypotheses Results

S/No.	Hypotheses	Rho Value	Strength of Relationship	Sig. Level	Decision Null Ho:	Alternate Hi
Ho_1	There is significant relationship between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks.	0.81**	Very Strong	0.01	Rejected	Accepted
Ho_2	There is significant relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks.	0.785**	Very Strong	0.01	Rejected	Accepted

S/No.	Hypotheses	Rho Value	Strength of Relationship	Sig. Level	Decision Null Ho:	Alternate Hi
Ho3	There is significant relationship between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks	0.812**	Very Strong	0.01	Rejected	Accepted
Ho4	There is significant relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks	0.839**	Very Strong	0.01	Rejected	Accepted

Summary of Findings

The findings of this study are summarized as follows:

a) There is a strong positive correlation between Artificial Intelligence (AI) technology infrastructure and decision-making processes in Nigerian banks (rho = 0.81**). This implies that there is a significant relationship between AI technology infrastructure and decision-making processes in Nigerian banks. AI technology infrastructure has improved decision-making processes, speed of transaction processing, and reduced errors in Nigerian banks.

b) There is significant relationship between Artificial Intelligence (AI) algorithm complexity and decision-making processes in Nigerian banks. AI algorithm complexity has a strong positive correlation with decision-making processes (rho = 0.785*).

c) There is significant relationship between Artificial Intelligence (AI) algorithm complexity and customer satisfaction in Nigerian banks. AI algorithm complexity has improved customer satisfaction levels, complaint resolution time, and enabled real-time monitoring and reporting in Nigerian banks. AI algorithm complexity has a strong positive correlation with customer satisfaction (rho = 0.812*).

d) There is significant relationship between Artificial Intelligence (AI) technology infrastructure and customer satisfaction in Nigerian banks. That there is a very strong positive correlation between AI technology infrastructure and customer satisfaction in Nigerian banks (rho = 0.839**).

The overall summary is that AI technology infrastructure and AI algorithm complexity have a significant positive impact on decision-making processes and

customer satisfaction in Nigerian banks. The results suggest that AI has improved decision-making processes, speed of transaction processing, and reduced errors, leading to enhanced customer satisfaction.

Conclusion

The study provides conclusive evidence that Artificial Intelligence (AI) technology infrastructure and AI algorithm complexity have a profoundly positive impact on decision-making processes and customer satisfaction in Nigerian banks. The strong positive correlations between AI technology infrastructure and decision-making processes (rho = 0.81*), AI algorithm complexity and decision-making processes (rho = 0.785), AI algorithm complexity and customer satisfaction (rho = 0.812), and AI technology infrastructure and customer satisfaction (rho = 0.839*) underscore the significance of AI adoption in Nigerian banking. The findings suggest that AI adoption has improved decision-making processes, speed of transaction processing, and reduced errors, leading to enhanced customer satisfaction. Furthermore, AI algorithm complexity has improved customer satisfaction levels, complaint resolution time, and enabled real-time monitoring and reporting in Nigerian banks. The study's conclusions have significant implications for bank managers, policymakers, and stakeholders. The findings highlight the need to invest in AI technologies to enhance banking operations, competitiveness, and customer satisfaction. The study recommends that Nigerian banks prioritize AI adoption to optimize business operations, improve decision-making processes, and enhance customer satisfaction. Ultimately, the study demonstrates that AI adoption is a critical success factor for Nigerian banks seeking to enhance their operational efficiency, decision-making processes, and customer satisfaction.

Recommendations

The following recommendations are given based on the findings and conclusion:

1. Invest in AI Technology Infrastructure: Nigerian banks should prioritize investing in AI technology infrastructure to enhance decision-making processes, operational efficiency, and customer satisfaction.
2. Banks should develop AI-driven decision-making processes to enhance operational efficiency, reduce errors, and improve customer satisfaction.
3. Policymakers, regulators, and banks should provide training and development programs for employees and offer incentives to encourage the adoption of AI technology infrastructure and algorithm complexity.

4. Policymakers and regulators should establish standards and guidelines for the adoption of AI technology infrastructure and algorithm complexity in Nigerian banks to ensure its effectiveness, efficiency, and security.

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