Fintech in the Performance of Nigeria Banking Industry

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Abstract
This study examined the effects of the fintech of bank performance (i.e., Automated Teller machine (ATM) services, internet banking (IB) services, Point of Sales (POS) services, mobile banking (MB) services and interest rates) in Nigeria. Specifically, the study evaluated how bank performance has been influenced by Automated Teller machine (ATM) services, internet banking (IB) services, Point of Sales (POS) services, mobile banking (MB) services and interest rate. The study was hinged on the Diffusion of Innovation Theory (DIT). The study estimation was based on the autoregressive distributed lag (ARDL) model. The result of the study showed that, from 2009Q1 to 2022Q4, ATM, internet banking and mobile banking services negatively impacted bank performance in Nigeria, while Point of Sales services positively impacted bank performance. This study recommends Nigerian banks invest in advanced security technologies, robust cybersecurity measures, and improved customer support services to mitigate ATM fraud risks, maintain the benefits of Point of Sales (POS) integration, and enhance regulatory frameworks for mobile banking operations.

Keywords: *fintech, bank performance, Nigeria, ARDL*

## 1.	Introduction

The significance of bank performance is a critical aspect of the financial industry, as it directly impacts the stability of the economy and the well-being of individuals and businesses. Bank performance refers to the ability of a bank to effectively manage its assets, liabilities, and overall operations in order to generate profits, maintain financial stability, and meet the needs of its customers (Torki, Rezaei & Razmi, 2020). The significance of bank performance can be analyzed from various perspectives, including its impact on economic growth, financial stability, and the welfare of stakeholders such as depositors, borrowers, and shareholders. In Nigeria, the performance of banks is of significant importance due to its impact on the overall economic stability and growth. The significance of bank performance in Nigeria can be analyzed from various perspectives, including its contribution to financial intermediation, economic growth, and stability.

Efficiency is a critical determinant of bank performance, and fintech plays a pivotal role in enhancing operational efficiency through automation, digitization, and process optimization (Owusu, Agyei & Amanor, 2019). Financial technology, or fintech, has revolutionized the financial services industry by leveraging technological innovations to enhance efficiency, accessibility, and customer experience. Fintech encompasses a wide range of applications, including mobile banking, peer-to-peer lending, blockchain technology, robo-advisors, and digital

payments. With the adoption of fintech solutions, banks can streamline their internal processes, reduce manual intervention, and improve productivity. For instance, the implementation of Automated Teller Machines (ATM) in bank operations Nigeria has enabled banks to duplicate basic banking services such as funds withdrawal, transfers, account balance checks, and even summary of statement of account. This not only reduces operational costs but also enhances accuracy and timeliness in processing transactions. Furthermore, fintech facilitates real-time data analytics and reporting capabilities, enabling banks to make informed decisions based on actionable insights derived from large volumes of structured and unstructured data.

Several theoretical frameworks provide insights into the potential impact of fintech on bank performance. These frameworks encompass various dimensions, including innovation diffusion, resource-based view, and disruptive innovation. While the Rogers' Innovation Diffusion Theory posits that the adoption of fintech solutions by banks may initially face resistance but eventually lead to widespread acceptance and integration into banking operations (Joseph, Ben-Caleb, Dike, Uche & Onwubiko, 2021). In the context of fintech and bank performance, agency theory highlights the potential conflicts of interest that may arise between different stakeholders due to the adoption of fintech solutions (Chinyere, Sabina & Chimaobi, 2021). For example, shareholders may expect fintech investments to generate higher returns, while managers may prioritize risk management and regulatory compliance.

The emergence and evolution of fintech in Nigerian banks can be traced back to the early 2000s when technological advancements began to reshape the global financial industry. The adoption of fintech in Nigerian banks gained traction with the introduction of electronic payment systems such as Automated Teller Machines (ATMs), Point of Sale (POS) terminals, and online banking platforms. These technological innovations marked a significant shift towards digital banking and laid the foundation for further fintech integration within the Nigerian banking sector. Despite its numerous benefits, the integration of fintech in Nigerian banks is not without challenges. One of notable challenge is cybersecurity risk management (Joseph, Ben-Caleb, Dike, Uche & Onwubiko, 2021). With the increasing sophistication of cyber threats targeting banks and other financial institutions, maintaining robust cybersecurity measures is imperative for safeguarding sensitive financial data from potential breaches or fraudulent activities.

Besides, the emergence and rapid growth of fintech firms and services have reshaped the competitive landscape within the Nigerian banking sector. This innovative firms and services leverage technology to offer a wide range of financial services such as digital payments, lending platforms, investment management tools, and peer-to-peer transfers (Muttai, Njoka & Muchira, 2023). The rise of fintech companies in Nigeria can be attributed to several factors. Firstly, the increasing penetration of mobile phones and internet connectivity has created a conducive environment for the adoption of digital financial services. Secondly, the growing youth population in Nigeria, characterized by tech-savvy individuals, has been instrumental in driving the demand for innovative financial services. Fintech companies have been able to tap into this demographic by offering user-friendly and technologically advanced platforms that resonate with the preferences of younger consumers. As a result, traditional banks are facing increased competition from agile and customer-centric fintech firms.

One of the primary challenges faced by banks is keeping pace with rapid technological advancements. Fintech companies have been quick to adopt cutting-edge technologies such as artificial intelligence (AI), machine learning, big data analytics, and blockchain to deliver seamless and personalized financial solutions (Alao, 2019). In contrast, many traditional banks have legacy systems that are not as agile or adaptable to rapid technological changes. This technological lag

hinders their ability to innovate at the same speed as fintech firms. Moreover, fintech companies have leveraged cloud computing infrastructure to build scalable and cost-effective platforms, enabling them to offer competitive services with lower operational costs. In contrast, banks may face challenges in transitioning from on-premises legacy systems to cloud-based architectures due to concerns related to security, compliance, and legacy system integration. This is the motivation for understudying the relationship between fintech and bank performance.

This study aims to investigate the relationship between fintech and the performance of the Nigerian banking industry by specifically examining the effects of Automated Teller Machine (ATM) services, internet banking (IB), Point of Sales (POS) services, and mobile banking (MB) on industry performance. This study focuses on investigating the relationship between fintech and performance of the Nigerian banking industry. This study will focus on the effect of ATM, internet banking, mobile banking and POS services, and how they affect the performance of the Nigerian banking industry. This study will be evaluated using quarterly time series data, which spans for fourteen years (2009Q1-2022Q4), relevant data will be obtained from Central Bank of Nigeria (CBN) publications such as CBN statistical bulletin

2.   Literature review
2.1   Conceptual framework

The concept of fintech, or financial technology, is an originating term that flow out of information and communication technology (ICT) as well as its application to finance. Information and Communication Technology (ICT) and Financial Technology (Fintech) are two fast growing fields that have revolutionized the way businesses operate, communicate, and provide services. In this comprehensive analysis, we will explore into the concepts of ICT and Fintech. Information and Communication Technology (ICT) refers to the technologies used to manage and process information, as well as the devices used to transmit data (Al-Amarneh, Yaseen, Atta & Khalaf, 2023). ICT comprises a wide range of technologies that facilitate communication, data management, and information sharing. These technologies include computers, software applications, networks, telecommunications infrastructure, and other digital tools. One of the key components of ICT is the internet, which serves as a global network that enables spread of information across geographical boundaries. The internet has transformed the way people communicate, access information, conduct business, and collaborate on projects. With the advent of the internet, ICT has become an essential part of modern society, influencing various aspects of daily life.

On the other hand, Financial Technology (Fintech) involves the use of technology to deliver financial services like storing, saving, borrowing, investing, transferring funds, and safeguarding money more efficiently and effectively (Muttai, Njoka & Muchira, 2023; Yua, Daniel & Epor, 2023). Fintech companies leverage cutting-edge technologies such as artificial intelligence (AI), blockchain, big data analytics, cloud computing, and mobile applications to disrupt traditional financial institutions and offer innovative solutions to consumers. Fintech encompasses a wide range of services including online banking, peer-to-peer lending platforms, digital payment systems, robo-advisors for investment management, crowdfunding platforms for raising capital from investors. These services are designed to provide users with convenient access to financial products and services while reducing costs associated with traditional banking.

One of the key advantages of Fintech is its ability to democratize finance by making financial services more inclusive and accessible to underserved populations (Yua, Daniel & Epor, 2023). Fintech companies cater to unbanked individuals who lack access to traditional banking services

by offering them alternative financial solutions through mobile wallets or digital payment platforms (Yang, Li, Ma & Chen, 2018). Moreover, Fintech has revolutionized the way people manage their finances by providing them with personalized financial advice based on their spending habits, investment goals risk tolerance. Robo-advisors use algorithms to recommend investment strategies tailored to individual preferences without the need for human intervention. In addition to consumer-facing services, Fintech also plays a crucial role in optimizing back-office operations for the banking industry and other financial institutions by automating processes such as risk assessment, credit scoring, and compliance monitoring. By implementing fintech solutions banks can reduce operational costs improve regulatory compliance streamline internal workflows. Furthermore, Torki, Rezaei and Razmi (2020) availed that Fintech has the potentials to facilitate cross-border transactions by enabling faster cheaper more secure international payments through block chain technology smart contracts crypto currencies. These innovations have reduced transaction fees, processing times, and eliminated intermediaries in global money transfers, benefiting businesses and individuals alike.

The fintech sector is made up several component services. One of it is the Automated Teller Machine (ATM), which is a computerized device that provides financial services to customers of financial institutions without the need for human tellers (Anusi & Igbodika, 2019). ATMs are commonly found in banks, retail stores, and other locations where customers may need access to cash or other banking services outside of regular business hours. The convenience and accessibility of ATMs have made them an essential part of modern banking systems worldwide. The concept of the ATM dates back to the 1960s when various inventors and engineers began exploring ways to automate banking transactions. The first successful deployment of an ATM occurred in 1967 when Barclays Bank introduced a cash dispenser in London. This early version of the ATM allowed customers to withdraw a fixed amount of cash using special vouchers (Opusunju, Akyuz & Aku, 2022).

The second one is Point of Sale (POS) machine, also known as a POS terminal or POS system, is a technological device used in retail and hospitality businesses to process transactions between customers and merchants (Saleh, Umar & Magaji, 2021). The primary function of a POS machine is to facilitate the sale of goods or services by recording and processing payment information. These devices have become an essential tool for businesses of all sizes, enabling them to streamline their operations, improve customer service, and manage inventory more efficiently. The POS machine consists of hardware and software components that work together to complete a transaction. The hardware typically includes a computer or tablet, a cash drawer, a barcode scanner, a receipt printer, and a credit card reader. The software component of the POS system manages the transaction process, records sales data, generates reports, and integrates with other business systems such as inventory management and customer relationship management software. One of the key features of a POS machine is its ability to accept various forms of payment, including cash, credit cards, debit cards, mobile payments, and electronic wallets. This flexibility allows businesses to cater to the diverse preferences of their customers and adapt to changing trends in payment technology (Akerejola, Okpara, Ohikhena & Emenike, 2019).

The third is internet banking, also known as online banking or e-banking, refers to the provision of banking services through the internet (Michael, Ahmad, Hakeem, Ekpe & Babajide, 2020). It allows customers to perform various financial transactions remotely, without the need to visit a physical bank branch. Internet banking has revolutionized the way people manage their finances by providing convenient access to a wide range of banking services anytime and anywhere with an internet connection. One of the key features of internet banking is the ability to check account

balances and transaction history online. Customers can monitor their account activity in real-time, which helps them keep track of their finances more effectively. In addition, internet banking allows customers to transfer funds between accounts, pay bills, set up recurring payments, and manage their investments online. These services offer greater convenience and flexibility compared to traditional banking methods (Aduaka & Awolusi, 2020).

The fourth is mobile banking, also known as m-banking or SMS banking, refers to the provision of banking services through mobile devices such as smart phones and tablets (Osiolo & Sije, 2023). It allows customers to perform various financial transactions remotely, without the need to visit a physical bank branch. Mobile banking has revolutionized the way people manage their finances by providing convenient access to a wide range of banking services anytime and anywhere. This innovative technology has transformed the traditional banking landscape, offering customers greater flexibility, convenience, and control over their financial activities. Mobile banking is known for its accessibility. With the widespread adoption of smart phones and mobile internet connectivity, customers can now access their bank accounts and conduct transactions with ease. Mobile banking apps provided by banks allow users to check their account balances, view transaction history, transfer funds between accounts, pay bills, and even apply for loans or credit cards. This level of convenience has made mobile banking increasingly popular among consumers who value efficiency and flexibility in managing their finances (Obi-Nwosu & Ubah, 2023).

2.1.1 Fintech in Nigeria

The emergence of fintech in Nigeria can be traced back to the early 2000s when mobile money services were introduced to address the challenges of financial inclusion. Companies like Paga and Interswitch pioneered digital payment solutions that allowed Nigerians to transfer money easily and securely using their mobile phones. These innovations laid the foundation for the growth of the fintech industry in the country. Over the years, the Nigerian government has taken steps to promote financial inclusion and support the development of fintech. The Central Bank of Nigeria (CBN) has introduced various initiatives such as the National Financial Inclusion Strategy and the Cashless Policy to drive the adoption of digital financial services. These efforts have created an enabling environment for fintech startups to thrive and innovate.

Nigeria, with a population of over 200 million people, is the most populous country in Africa and has the largest economy on the continent. The country has seen significant growth in the fintech sector in recent years, driven by a number of factors including a large unbanked population, increasing smart phone penetration, and government initiatives to promote financial inclusion. Nigeria is transitioning into a dynamic ecosystem offering FinTech start-ups a platform to succeed and potentially grow into multi-million-dollar businesses. According to KPMG (2016), the Nigerian economy, which is predominantly cash-driven, has been responding well to the FinTech opportunity, partly demonstrated by the exponential growth in mobile money operations from an average monthly transaction value of US$5 million in 2011 to US$142.8 million in 2016. The growing FinTech penetration can be attributed to a surge in e-commerce, and smart phone penetration. Nigeria's growth wave is still far behind global counterparts, but it is stacked well, largely due to a strong talent pipeline of easy-to-hire and inexpensive tech workforce. From payments to lending to insurance, FinTech services are redefining the way businesses and consumers carry out routine transactions. The increasing adoption of these trends is positioning Nigeria as an attractive market worldwide.

Other initiative by the Nigerian government is the National Financial Inclusion Strategy (NFIS), which aims to reduce the percentage of Nigerians who are financially excluded from 46.3% in

2010 to 20% by 2020. The NFIS includes several measures aimed at increasing access to financial services, such as expanding agent networks, promoting mobile banking, and supporting financial literacy programs. Another important government initiative is the Central Bank of Nigeria's (CBN) cashless policy, which aims to reduce the use of physical cash in transactions and promote electronic payments. The policy includes several measures aimed at encouraging the use of electronic payments, such as reducing charges for electronic transactions and increasing charges for cash withdrawals.

2.2.2 Bank Performance

The concept of bank performance refers to the evaluation of a bank's financial health, efficiency, profitability, and overall effectiveness in achieving its objectives (Yua, Daniel & Epor, 2023). Banks play a crucial role in the economy by facilitating the flow of funds between savers and borrowers, providing essential financial services, and contributing to economic growth. upon providing these services, they are also profit-oriented ventures. Performance measurement is a critical aspect of managing a bank effectively. Banks use a variety of metrics to evaluate their performance and track their progress towards achieving strategic goals. Some of the key performance indicators (KPIs) used by banks include profitability ratios, liquidity ratios, efficiency ratios, asset quality metrics, and capital adequacy ratios. Profitability ratios such as return on assets (ROA) and return on equity (ROE) are commonly used to assess a bank's ability to generate profits from its assets and equity capital.

One of the primary objectives of banks is to generate profits, which are essential for their sustainability and growth. Profitability is a key indicator of a bank's performance and reflects its ability to efficiently allocate resources, manage risks, and meet the needs of its stakeholders (Joseph, Ben-Caleb, Dike, Uche & Onwubiko, 2021). Profitability is a fundamental metric that measures a bank's ability to generate earnings from its operations. Banks rely on profits to cover operating expenses, build capital reserves, and distribute dividends to shareholders. Profitability is also essential for attracting investors and maintaining a strong credit rating, which enables banks to access funding at competitive rates. Moreover, profitable banks are better positioned to withstand economic downturns, regulatory changes, and competitive pressures.

2.2.2.2 Measures of Bank Performance: The Profitability Perspective

Return on assets (ROA), return on equity (ROE), and net interest margin (NIM) are key financial metrics used by investors, analysts, and financial institutions to evaluate the performance and profitability of a company. These metrics provide valuable insights into how efficiently a company is utilizing its assets to generate profits, how well it is generating returns for its shareholders, and how effectively it is managing its interest income relative to its interest-earning assets. Understanding these concepts is essential for making informed investment decisions and assessing the financial health of a business.

Return on Assets (ROA)

Return on Assets (ROA) is a financial ratio that measures a company's ability to generate profits from its assets. It is calculated by dividing the company's net income by its average total assets (Yua, Daniel & Epor, 2023). ROA indicates how efficiently a company is using its assets to generate earnings. A higher ROA suggests that the company is more efficient in utilizing its assets to generate profits, while a lower ROA may indicate inefficiency or poor asset management.

$$ROA = \frac{Net\ income}{Average\ total\ assets}$$

Return on Equity (ROE) is another important financial metric that measures a company's profitability in relation to its shareholders' equity. It is calculated by dividing the company's net income by its average shareholders' equity (Hermuningsih, Sari & Rahmawati, 2023). ROE provides insights into how well a company is generating returns for its shareholders. A higher ROE indicates that the company is more effective at generating profits with the shareholders' equity invested in the business, while a lower ROE may suggest lower profitability or inefficient use of equity capital.

$$ROE = \frac{Net\ income}{Average\ Shareholders'Equity}$$

Net Interest Margin (NIM) is a critical metric for financial institutions, particularly banks, as it measures the difference between the interest income earned from loans and investments and the interest expenses paid on deposits and borrowings (Yoon, Hongbok & Ingyu, 2023). NIM reflects the profitability of a bank's core lending and deposit-taking activities. A higher NIM indicates that the bank is earning more from its interest-earning assets than it is paying on interest-bearing liabilities, while a lower NIM may suggest challenges in managing interest rate risk or intense competition in the lending market.

$$ROA = \frac{Interest\ Income - Interest\ Expenses}{Average\ Earning\ Assets}$$

These financial metrics play a crucial role in assessing the performance and financial health of companies and banking industry. Investors use ROA and ROE to evaluate the efficiency and profitability of businesses, while banks rely on NIM to monitor their interest rate spread and overall profitability. By analyzing these metrics in conjunction with other financial indicators, stakeholders can gain a comprehensive understanding of a company's operational efficiency, profitability, and risk management practices.

In essence, return on assets (ROA), return on equity (ROE), and net interest margin (NIM) are fundamental financial metrics that provide valuable insights into the performance and profitability of companies and financial institutions. Understanding these concepts is essential for investors, analysts, and stakeholders seeking to make informed decisions about investments, assess business performance, and evaluate risk exposure. By calculating and interpreting these metrics accurately, individuals can gain a deeper understanding of how efficiently companies are utilizing their assets, generating returns for shareholders, and managing interest income relative to their interest-earning assets.

2.1.2   FinTech and Bank Performance in Nigeria

Nigeria's banking sector has undergone significant transformations over the years, influenced by various internal and external factors such as regulatory changes, economic conditions, technological advancements, and market competition. The performance of banks in Nigeria is typically assessed using key financial indicators such as profitability, liquidity, asset quality, capital adequacy, and efficiency. These indicators provide insights into how well banks are managing their resources, generating profits, managing risks, and serving their customers. Profitability is a crucial measure of bank performance in Nigeria, as it indicates the ability of banks to generate earnings from their core banking activities (Chinyere, Sabina & Chimaobi, 2021). Profitability ratios such as return on assets (ROA) and return on equity (ROE) are commonly used to assess how efficiently banks are utilizing their assets and equity capital to generate profits. A

higher ROA and ROE suggest that a bank is effectively managing its resources and generating satisfactory returns for its shareholders.

To understand this relationship, it is essential to examine the role of fintech in reshaping the banking landscape in Nigeria, the challenges and opportunities it presents for traditional banks, and its implications for overall financial stability and inclusion in the country. One of the key ways in which fintech is influencing bank performance in Nigeria is through increased competition (Alao, 2019). Fintech companies are leveraging technology to offer innovative financial products and services that cater to the needs of underserved segments of the population. This has intensified competition in the banking sector, forcing traditional banks to rethink their business models and strategies to stay competitive. Moreover, fintech has also enabled banks to enhance their operational efficiency and reduce costs through automation and digitization (Owusu, Agyei & Amanor, 2019). By leveraging technologies such as artificial intelligence, block chain, and data analytics, banks can streamline their processes, improve customer service, and offer personalized financial solutions. This not only improves the overall customer experience but also enhances the profitability and performance of banks.

However, despite the numerous benefits that fintech offers to banks in Nigeria, there are also challenges that need to be addressed. One of the main challenges is regulatory uncertainty and compliance issues. The rapid pace of technological innovation in fintech often outpaces regulatory frameworks, leading to concerns about data privacy, cyber security, and consumer protection. Banks need to navigate these regulatory challenges effectively to ensure compliance while fostering innovation. Furthermore, cyber security threats pose a significant risk to both fintech companies and traditional banks in Nigeria. As digital transactions increase, so do the opportunities for cybercriminals to exploit vulnerabilities in online systems. Banks must invest in robust cyber security measures to protect customer data and maintain trust in their services. In addition to regulatory and cyber security challenges, fintech also presents risks related to financial stability. The interconnected nature of fintech platforms with traditional banking systems means that disruptions or failures in one sector can have cascading effects on the entire financial ecosystem. Banks need to assess these systemic risks carefully and implement risk management strategies to mitigate potential threats to financial stability.

Despite these challenges, the collaboration between fintech companies and traditional banks presents opportunities for synergies that can drive innovation and growth in the Nigerian banking sector. The collaboration between fintech firms and traditional banks in Nigeria has led to partnerships that leverage each other's strengths to drive innovation and improve overall bank performance. By integrating fintech solutions into their existing infrastructure, banks can enhance their service offerings, expand their customer base, and stay competitive in an evolving financial landscape. By partnering with fintech firms, banks can leverage their technological expertise and customer reach to develop new products and services that meet evolving consumer demands. This collaboration can lead to greater efficiency, improved customer experience, and sustainable growth for both parties.

2.2 Theoretical framework: Diffusion of Innovation Theory

Diffusion of Innovation Theory is a widely recognized theory in the field of sociology, communication, marketing, and technology that explains how new ideas, products, or technologies spread through a population over time. Developed by Everett Rogers in 1962, the theory provides insights into the process of adoption and diffusion of innovations within a social system. The theory has been applied to various fields such as healthcare, agriculture, education, and business

to understand the factors that influence the rate of adoption and diffusion of innovations. The Diffusion of Innovation Theory is based on the premise that individuals within a social system differ in their willingness to adopt new ideas or technologies. According to Rogers, there are five categories of adopters based on their innovativeness: innovators, early adopters, early majority, late majority, and laggards (Yua, Daniel & Epor, 2023). Innovators are the first to adopt an innovation, followed by early adopters who are opinion leaders in their social networks. The early majority and late majority adopt an innovation after it has been proven successful by early adopters, while laggards are the last to adopt due to skepticism or resistance to change.

This study uses the Diffusion of Innovation Theory (DIT) to explain why and how new ideas are accepted, as well as the methods and speed at which technology spreads. According to Dearing (2009) and Yua, Daniel and Epor (2023), diffusion refers to the spread of an innovation over time among members of a social system, while innovation refers to an idea, activity, or object that is viewed as novel by an individual or group of adopters. He identified four key factors that influence innovation diffusion: inventions, communication routes, social systems, and relative advantage. According to Yua, Daniel and Epor (2023), an innovation is a fresh concept, practice, or thing that can lead to social change, whereas a communication channel is the process of conveying messages. The term "timer" refers to the time it takes for individuals to embrace new ideas in a society. The social system is made up of several classes of constituents, including social, cultural, and religious organizations.

According to Wani and Ali (2015), the diffusion of innovation theory explains the elements influencing technological adoption, including relative advantage, trialability, observability, complexity, and compatibility. According to the author, perceived value and novelty of an idea are influenced by relative benefit in comparison to existing options. This should demonstrate the potential to improve an individual's life by using new approaches. Trialability refers to an operator's willingness to adopt FinTech technologies like Point of Sale (POS) and banking innovations for a set period of time.

2.4   Review of Empirical Literature

Almashhadani and Almashhadani (2023) explored the impact of financial technology on banking performance: it studies on foreign banks in UAE. This study used a quantitative method. The population was drawn on 19 UAE based banks, their results reveal that Fintech has enhances positive relationship both Return on Assets (ROA) and Return on Equity (ROE). This study shows that Fintech has a positive influence on bank performance of Return on Assets (ROA) and Return on Equity (ROE).

Al-Amarneh, Yaseen, Atta and Khalaf (2023) study the nexus between information technology investment and bank performance in Jordan. The study draws a sample size of 13 commercial banks listed on the Amman Stock Exchange between the period of 2010 and 2021. The research adopts, descriptive statistics, correlation analysis, the panel least squares approach, and fixed effects multiple regression models are used. The result shows that banks, on average, typically allocate about 0.61%t of their assets to information technology (hardware and software). Additionally, banks that invest in IT are predicted to perform better over time, as evidenced by their increased profitability and operational efficiency.

Baker, Kaddumi, Nassar and Muqattash (2023) explored the main Fintect adopted tools used by banks to improve their financial performance. Their study center on commercial banks listed on

the Jordan and UAE, using data from 2012 to 2020. A total of 115 questionnaires, consisting of five questionnaires for each bank, were distributed to the study population in Jordan and the United Arab Emirates were respondent. The dependent variable is financial performance, while the independent variable is financial technology (FinTech). Multiple linear regression analysis was conducted to test the hypotheses. The results revealed that FinTech adopt positive effect both on deposit and net profits.

Muttai, Njoka and Muchira (2023) assessed the impact that financial technology had on the financial performance of commercial banks in Kenya. The targeted goals were to establish the effect of mobile banking, internet banking, agency banking, ATMs on financial performance; and to establish the moderating role of bank size on the relationship between financial technology and the financial performance of commercial banks. The research employed the technological model, using financial intermediation theory, diffusion of innovation theory, and the profit maximization theory. A panel longitudinal research methodology was adopted for the research with secondary data from annual reports. The study revealed that financial technology explains financial performance and also the financial technology is sufficient in predicting financial performance. Additional study findings out that mobile banking, internet banking, agency banking, adoption of ATMs, and bank size had enhanced positive significant correlations with financial performance.

Yua, Daniel and Epor (2023) investigated the relationship between selected financial inclusion/financial technology variables and banks' performance in Nigeria for the period of ten years with specific objective to determine the extent to which financial inclusion/financial technology has deepened on the performance of banks in Nigeria. They used Return on Asset (ROA) as proxied for bank performance and analyzed semi-annual data from the Central Bank of Nigeria (CBN) statistical bulletin for (2009-2019). The study adopts the Autoregressive Distributed Lag (ARDL) modelling technique. Empirical results revealed that financial technology variables namely (POS Transaction, ATM) had positive effect on bank performance in the long-run. While mobile banking payment (MBP) has a negative significant effect on bank performance, POS was significant, ATM did not show strong significant in influencing in the long-run performance.

Anindyastri, Lestari and Sholahuddin (2022) assessed to determine the influence of mobile banking, internet banking, and SMS banking on the financial performance of Islamic banking using Return on Assets (ROA) as proxied for bank performance. This study adopted annual data from of annual financial statements of Islamic Banks listed on the Indonesia Stock Exchange for the period (2016-2020). The study used regression analysis of panel data. The results revealed that mobile banking has a showed strong significance in influencing the financial performance of Islamic banking, while internet banking and SMS banking have a negative insignificance influence on the financial performance of Islamic banking.

Chinyere, Sabina and Chimaobi (2021) examined the effect of Information and Communication Technology (ICT) impacts corporate performance using Zenith Bank Nigeria Plc. and United Bank for Africa Plc. Data were drawn from annual financial statement published by the bank from 2010-2016. They measured corporate performance using Return on Equity, Return on Asset and Earnings per Share. They adopted ordinary least square regression technique employing SPPS Version 21. Their findings revealed that ICT had a negligible effect on corporate performance measured with return on equity and no effect on corporate performance measured with return on assets, but did enhances effect on corporate performance measured with earnings per share.

Joseph, Ben-Caleb, Dike, Uche and Onwubiko (2021) examined the impact of electronic banking on the financial performance of Nigerian deposit money banks. Data for study was drawn from

Central Bank of Nigeria's Statistical Bulletin and the National Bureau of Statistics for various years, as well as from published financial statements of deposit banks. They adopted Regression to test hypotheses. The results revealed that ATM usage has a positive significant association with increased Earnings per share and Return on Assets. POS and NEFT were significantly affecting ROA only, while Web Banking has an insignificant impact on both Earnings Per Share and Return on Assets. It is concluded that electronic banking significantly affects financial performance of deposit money banks in Nigeria.

Hossain (2021) study on how e-banking technology affects the financial performance of state-owned commercial banks in Bangladesh's. It adopted using pooled ordinary least square (OLS) regression on panel data. The results revealed that after a year e-banking is implemented, banks in Bangladesh's experience a negative impact on the Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). However, the studies suggest that one year after using electronic banking, ROA improves significantly.

Adeyinka, Daniel and Adeniyi (2019) assessed the effect of Information and Communication Technology (ICT) on profit performance of Deposit Money Banks in Nigeria for the period of (2007-2017). The adopted Regression Equation, the Value of transactions is the dependent variable and the Volume of transactions is the independent variable. Data was drawn from the Central Bank of Nigeria Financial Stability Report, the Central Bank of Nigeria Draft Annual Report, and the Financial Statement. The results revealed there is no significant relationship between the value of ICT transactions and the volume of ICT transactions in the first half of the (January to June) and none in the second half (July to December), but there is a significant association when considering the full year (January-December).

Ghose and Maji (2022) assessed data from 67 Indian commercial banks for the period of (2011-2019) to investigates how the impact of internet banking on bank performance measured by its volume and value to bank profitability using Return on Assets and Return on Equity as proxied. The result shows that using internet banking increased the profitability of the bank, and the higher positive impact was in public sector banks as a result of economies of scale of operation. In their study of 23 economies between 2002 and 2016,

Le and Ngo (2020) investigates the elements influencing bank profitability. Using cross-country study across 23 economies, exploiting system GMM modeling. Their results revealed that a number of distribution channels, such as bank cards, ATMs, and point-of-sale terminals, can boost a bank's profitability. These delivery alternatives should be expanded in light of this. Meanwhile, market forces have a detrimental effect on bank profitability. Consequently, competition boosts bank profits. In conclusion, a more diverse financial sector and a less concentrated banking industry can boost bank profitability.

Islam, Kabir, Dovash, Nafee and Saha (2019) investigate the relationship between online banking, a type of IT adoption, and banks' productivity, efficiency, and profitability. Performance is indicated by ROA and ROE as proxies. The data are derived from the yearly reports of 30 listed banks. The findings indicate that banks with online banking services have higher ROA and ROE than those without any. Therefore, customers prefer banks with online services due to their convenience and benefit. At the same time, such services allow a bank to reduce their operating costs. Six Islamic countries – Jordan, Kuwait, Iran, Malaysia, Senegal, and Indonesia – were chosen by Torki, Rezaei and Razmi (2019) to study how the use of electronic payment systems affected the performance of the financial sector in each of these nations from 2011 to 2017. The study used automated teller machines, bank cards, cell phones, online banking, and bank accounts as proxies for FinTech payment methods. The results show that different payment methods have a

favorable and significant impact on how well the banking industry performs. The results also demonstrate that for the chosen countries, economic conditions and population growth have a significant positive impact on the financial sector's performance, whereas inflation and interest rates have a significant negative effect.

Owusu, Agyei and Amanor (2019), use the data envelopment analysis (DEA) to investigate causality between the efficiency of applying information technology (IT) and bank performance. The results show that there are both short-run and long-run relationships between IT efficiency and cost performance. Indicating that; application of IT in bank operations will contribute significantly on bank performance. In the period 2010–2016,

Harelimana (2018), assessed the relationship between ATMs and bank profitability. The results revealed that a barrier to providing ATM services continues to be a lack of financial education (such as knowledge and client training on how to use ATM cards). The studies show that between ATM and ROA and between ROE and Net Margin it has no statistically significant. Low cost, differentiation, and accessibility variables all have negative influence on how satisfied ATM user's are. The profitability and cost efficiency of five Chinese banks that have completely embraced the e-banking system are examined by Yang, Li, Ma and Chen (2018). The data are drawn directly from the banks' annual reports. ROA, ROE, operating margin, NIM, and efficiency ratio are all used to assess bank performance. The results revealed that e-banking boosts ROA, ROE, and OM. The impact on NIM and efficiency ratio, however, is minimal.

3.   Data and methodology

This study uses an ex-post facto design, analyzing quarterly data from the Central Bank of Nigeria statistical bulletin from 2009Q1 to 2022Q4. To investigate how fintech affects the performance of the Nigerian banking industry. Quarterly data were used because of the frequency at which these fintech transactions take place. This study is based on a time frame sample and a stratified sample. The time frame sample will be based on quarterly data series from 2009Q1 to 2022Q4. While the stratified sample will be based on the commercial banks' unified reports on performance. Quarterly time series data from 2009Q1 to 2022Q4 will be collected from the Central Bank of Nigeria statistical bulletin, and bank performance data will be sourced from the CBN annual and quarterly reports on the Nigerian economy and the banking sector.

Model Specification

The model of the study was a modification of the model of Yua, Daniel and Epor (2023). They carried out a study titled: "Testing the Nexus between Financial Inclusion and Banks' Performance in Nigeria: The role of Financial Technology". Using the model:

$$BNKP = f(FinTech) \qquad\qquad 1$$

And disaggregated into:

$$BNKP = f(ATM, IB, POS, MB) \qquad\qquad 2$$

Where,

BNKP	-	Bank performance as proxied by banks' return on assets
ATM	-	ATM transaction to total assets ratio
IB	-	Internet banking transaction to total assets ratio
POS	-	POS transaction to total assets ratio
MB	-	mobile banking transactions to total assets ratio

The above model was modified to suit the nature of this study and in order to ascertain the effect of FinTech on the performance of the Nigerian banking industry, the model for this study is specified thus:

$$BNKP = \beta0 + \beta1ATM + \beta2IB + \beta3POS + \beta4MB + \mu \qquad\qquad 3$$

Method of Data Analysis
In this study, studying the impact relationship from fintech on banking industry performance in Nigeria, the popularized ARDL model will be used to estimate the fintech parameters,

$$\Delta BNKP_t = \partial_0 + \sum_{k=1}^{p}\partial_1\Delta BNKP_{t-k} + \sum_{k=1}^{p}\partial_2\Delta ATM_{t-k} + \sum_{k=1}^{p}\partial_3\Delta IB_{t-k} + \sum_{k=1}^{p}\partial_4\Delta POS_{t-k}$$
$$+ \sum_{k=1}^{p}\partial_5\Delta MB_{t-k} + \alpha_1 BNKP_{t-1} + \alpha_2 ATM_{t-1} + \alpha_3 IB_{t-1} + \alpha_4 POS_{t-1}$$
$$+ \alpha_5 MB_{t-1}$$
$$+ \mu_t \qquad\qquad 4$$

4.   Results and analysis
Descriptive analysis was conducted as part of preliminary test to observe the statistical characteristics of the variables used for the Fintech in the performance of Nigeria banking industry study. The raw data, obtained from the Central Bank of Nigeria Statistical Bulletin, are in percentages. The unification of data became necessary for easy interpretation and to conform to unity in linear rule. The data are quarterly data, ranging from 2009Q1 to 2022Q4. Table 1 presents values for mean, median, minimum, maximum, and standard deviation. From the table, the mean values for BNKP, ATM, IB, MB, and POS are 0.65%, 11.69%, 0.702%, 4.18%, and 3.30%, respectively. While the above statements are for the mean values of the variables under consideration, the Jarque-Bera test, with the respective probability values, 0.000000, 0.071741, 0.029595, 0.015541, and 0.024959, means that BNKP, IB, MB, and POS are not normally distributed. Also, the standard deviation information revealed that ATM, with a standard deviation value of 4.629 is the most volatile among all the ones we used in the study.

Table 1: Descriptive Statistics

	BNKP	ATM	IB	MB	POS
Mean	0.653929	11.69775	0.702467	4.180072	3.300262
Median	1.145195	12.79417	0.398704	1.930969	1.888510
Maximum	5.360000	18.58519	1.854728	12.40779	7.732715
Minimum	-18.98250	1.598750	0.117772	0.001930	0.055393
Std. Dev.	3.605444	4.629831	0.558727	4.612860	3.115869
Skewness	-3.797711	-0.745081	0.634662	0.713886	0.357803
Kurtosis	19.61649	2.805775	1.814218	1.762728	1.371742
Jarque-Bera	778.8627	5.269379	7.040277	8.328543	7.381071
Probability	0.000000	0.071741	0.029595	0.015541	0.024959
Sum	36.62000	655.0740	39.33813	234.0840	184.8147
Sum Sq. Dev.	714.9574	1178.943	17.16965	1170.316	533.9751
Observations	56	56	56	56	56

Source: E-view 12 version

Correlation Analysis

Correlation indicates the degree of association between variables. It assesses the extent and strength of the association between two variables. The correlation analysis does not only show the association between variables but also show the possibility of collinearity among independent variables. The correlation matrix of the variables employed in this study is present in Table 4.2.

Table 2:   Correlation Matrix of Variables

Correlation Probability	BNKP	ATM	IB	MB	POS
BNKP	1.000000				

ATM	0.236517	1.000000			
	0.0793	-----			
IB	-0.046201	0.383704	1.000000		
	0.7353	0.0035	-----		
MB	0.134491	0.371003	0.836269	1.000000	
	0.3230	0.0049	0.0000	-----	
POS	0.142144	0.519678	0.913858	0.963532	1.000000
	0.2960	0.0000	0.0000	0.0000	-----

Source: Researcher, 2023

The result, as presented in Table 2, showed that there is evidence of high correlation between mobile banking and internet banking, as well as in the POS-internet banking and POS-mobile banking relationship. Again, all the fintech variables have positive relationship with bank performance except internet banking. However, none of the relationship is significant. However, to resolve this autocorrelation problem, we are going to apply lags in the regressors. This method has been advocated by earlier researchers (see, Epor, 2024).

Unit root tests: Augmented Dickey-Fuller Test

The ARDL modeling techniques is based on the fundamentals that data are stationary at I(0), I(1) or a combination of both (Epor, 2024). To ensure the data were free from stationarity defect, the stationarity test was checked using the Augmented Dickey-Fuller (ADF). The ADF test are presented in table 3.

Table 3: Augmented Dickey-Fuller Test for unit root

| Variables | ADF Tests: Levels | | ADF Tests First | | Order of Integration |
	ADF Test Statistic	p-values	ADF Test Statistic	p-values	
BNKP	-3.7826	0.0056			*I(0)*
ATM	-1.2502	0.1912	-3.3800	0.0160	*I(1)*
IB	-2.0030	0.5842	-1.9915	0.0455	*I(1)*
MB	-2.3416	0.4041	-4.3345	0.0065	*I(1)*
POS	-1.6314	0.4599	-8.6811	0.0000	*I(1)*

Source: Author, Eviews 12 edition

The ADF unit root test result in Table 4.3 depicts that bank performance variables were stationary at levels, while the other fintech variables are integrated at first difference. Since the variables are stationary at I(0) and I(1), we can conveniently apply the autoregressive distributed lag (ARDL) modeling technique. It is now important to test for cointegration by employing the ARDL bounds test to cointegration.

ARDL Bounds test for Cointegration

Recall that we stated to estimate one model in chapter three, which we tag: fintech of bank performance model. With these stated models, the ARDL bounds test was carried out on it. The ARDL bounds tests are presented in Table 4.

Table 4: The ARDL Bounds Test to Cointegration Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	33.29324	10%	2.68	3.53
K	4	5%	3.05	3.97
		2.5%	3.4	4.36
		1%	3.81	4.92

Source: Author, Eviews 12 edition

The ARDL bounds test from table 4 showed that the F-statistics from the model was more than the upper bounds at 5%. These revelation means that the fintech variables exhibit long-run relationship with bank performance. By this, there will be need to estimate the long-run and short-run models.

ARDL Long-run Model Estimation

In this phase, the ARDL technique will be used to estimate the research model, out of which the test values will be obtained. The estimated model from the coefficients is stated below:

$$BNKP = -0.5318 * ATM - 6.6097 * IB - 1.2482 * MB + 3.5432 * POS - 0.0945 * @TREND$$

From the model estimation above, both ATM, IB and MB have negative relationship with bank performance in Nigeria; while POS has positive relationship with bank performance in Nigeria.

4.3.4   ARDL Error Correction Model

Having established that the fintech variables are related to bank performance model variables in the long run, it then becomes necessary to determine this with an error correction model, which we expect to be significant, negative, and less than unity (Epor, Yua & Iorember, 2024). This was ascertained using the ARDL approach and provided in Table 5.

Table 5: The ARDL ECM for the fintech-bank performance model

ARDL Error Correction Regression
Dependent Variable: D(BNKP)
Selected Model: ARDL(1, 0, 0, 0, 0)
Case 4: Unrestricted Constant and Restricted Trend
Date: 07/18/24   Time: 16:15
Sample: 2009Q1 2022Q4
Included observations: 55

ECM Regression
Case 4: Unrestricted Constant and Restricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.892408	0.196624	14.71038	0.0000
CointEq(-1)*	-0.335399	0.022583	-14.85152	0.0000

R-squared	0.806264	Mean dependent var	0.364743
Adjusted R-squared	0.802608	S.D. dependent var	1.643517
S.E. of regression	0.730195	Akaike info criterion	2.244675
Sum squared resid	28.25876	Schwarz criterion	2.317668
Log likelihood	-59.72855	Hannan-Quinn criter.	2.272902
F-statistic	220.5677	Durbin-Watson stat	1.152972
Prob(F-statistic)	0.000000		

Source: Author, Eviews 12 edition

As can be seen in Table 5, the error correction model coefficients in the fintech-bank performance model did show the supposed negative and statistical significance at 5% significance level. The implication of this result is that there is significant error taking place and there is also the tendency of the model to move towards any long-term equilibrium following disequilibrium in previous periods.

4.4   Test of Hypotheses

The hypotheses tests were carried out for long-run model estimates. That means there are four (4) hypotheses to be tested against for the fintech-bank performance model.

Long run ARDL estimation and discussion of findings

The p-value of Automated Teller machine (ATM) services in the fintech-bank performance model (i.e., 0.0012), being less than the significance level (0.05), means that ATM have a statistically significant negative effects (β = -0.5318) in the fintech-bank performance model in Nigeria for the long-run period of 2009Q1 to 2022Q4. Hence, the null hypothesis that Automated Teller machine (ATM) services do not significantly affect bank performance in Nigeria is rejected and we conclude that Automated Teller machine (ATM) services have a significant negative effect on bank performance in Nigeria from 2009Q1 to 2022Q4. This means that increases in Automated Teller machine (ATM) services would make bank performance decline, and vice versa. This finding is in variance with Almashhadani and Almashhadani (2023) who earlier found significant and positive relationship between the Fintech and return on assets ROA. Automated Teller Machines (ATMs) are essential in Nigerian banking services, offering convenient access to cash. However, their high operational costs, particularly in unstable power supply, can erode profit margins. Additionally, ATMs are susceptible to fraud, including card skimming and unauthorized access, which can damage a bank's reputation and customer trust, especially in a country where cybercrime is prevalent.

The p-value of Internet banking (IB) services in the fintech-bank performance model (i.e., 0.0040), being less than the significance level (0.05), means that IB have a statistically significant negative effects (β = -6.6097) in the fintech-bank performance model in Nigeria for the long-run period of 2009Q1 to 2022Q4. Hence, the null hypothesis that Internet banking (IB) services do not significantly affect bank performance in Nigeria is rejected and we conclude that Internet banking (IB) services have a significant negative effect on bank performance in Nigeria from 2009Q1 to 2022Q4. This means that increases in internet banking (IB) services leads to decreases in bank performance, and vice versa. This agrees with Yua, Daniel and Epor (2023) who revealed that e-banking payment has negative and significant effect on bank performance. Internet banking services have revolutionized financial transactions globally, including in Nigeria. However, they also pose significant challenges, including cybersecurity risks. These risks include hacking, phishing attacks, and data breaches, which can compromise customer information and lead to financial losses, especially in Nigeria's less robust cybersecurity infrastructure.

Table 6:   **ARDL Regression Results of Fintech Services on Banking Industry Performancein Nigeria**

Variable	Coefficient	Std. Error	t-Statistic	p-Value
ATM	-0.5318	0.1541	-3.4513	0.0012***
IB	-6.6097	2.1872	-3.022	0.0040***
MB	-1.2482	0.4604	-2.7111	0.0093***
POS	3.5432	1.0999	3.2215	0.0023***
Trend	-0.0945	0.0828	-1.141	0.2595

Note. ***p < .01**, p < .05, *p < .10.   ATM = Automated Teller Machine; IB = Internet Banking; MB = Mobile Banking; POS = Point of Sale.

The p-value of Point of Sales (POS) services in the fintech-bank performance model (i.e., 0.0023), being less than the significance level (0.05), means that POS have a statistically significant positive effects (β = 3.5432) in the fintech-bank performance model in Nigeria for the long-run period of 2009Q1 to 2022Q4. Hence, the null hypothesis that Point of Sales (POS) services do not

significantly affect bank performance in Nigeria is rejected and we conclude that Point of Sales (POS) services have a significant positive effect on bank performance in Nigeria from 2009Q1 to 2022Q4.This means that increases in Point of Sales (POS) services leads to increases in bank performance, and vice versa. The finding agrees with that of Yua, Daniel and Epor (2023) who established that Point of Sales (POS) services have a positive effect on bank performance. POS services in Nigeria significantly improve bank performance by increasing transaction volume and enhancing customer experience. They facilitate convenient payments at retail locations, leading to higher revenue for banks. The convenience and speed of POS transactions also improve customer satisfaction, leading to increased loyalty and retention rates for banks.

The p-value of Mobile banking (MB) services in the fintech-bank performance model (i.e., 0.0093), being less than the significance level (0.05), means that MB have a statistically significant negative effects (β = -1.2482) in the fintech-bank performance model in Nigeria for the long-run period of 2009Q1 to 2022Q4. Hence, the null hypothesis that Mobile banking (MB) services do not significantly affect bank performance in Nigeria is rejected and we conclude that Mobile banking (MB) services have a significant negative effect on bank performance in Nigeria from 2009Q1 to 2022Q4.This means that increases in mobile banking (MB) services is detrimental bank performance, and vice versa. The finding agrees with Yua, Daniel and Epor (2023) and Anindyastri, Lestari and Sholahuddin (2022) who both established that mobile banking (MB) services has a positive impact on bank performance. Mobile banking services in Nigeria have revolutionized the financial sector, providing convenience and accessibility to millions of users. However, they also pose challenges to bank performance. Increased operational costs due to technology infrastructure, cybersecurity threats, and customer support systems can detract from other critical areas. Cybersecurity threats like hacking and data breaches can strain resources. Fintech companies, offering user-friendly interfaces and lower fees, also pose a threat to traditional banks, potentially eroding market share and profitability.

5.   Conclusion and recommendations

The study confirmed that fintech services exhibit both positive and negative long-run effects on bank performance in Nigeria, with results supporting the application of the ARDL model due to a mix of I(0) and I(1) variable integration. The ARDL bounds test confirmed a long-run relationship, and the error correction model revealed meaningful adjustment toward equilibrium. Specifically, Automated Teller Machine, Internet Banking, and Mobile Banking services had significant negative effects, while Point of Sales services had a significant positive effect on bank performance between 2009Q1 and 2022Q4.Despite this, the study faced limitations. First, only four fintech channels were examined, which may exclude other relevant digital innovations. Second, the focus on Nigeria alone limits the generalisability of findings across Sub-Saharan Africa. Furthermore, secondary data reliance may reflect reporting or coverage biases. Nonetheless, the ARDL technique remains robust to small samples and mixed integration orders, which strengthens the validity of the inferences drawn.

Despite the limitations, the strength of the study lies in its robust methodological framework, particularly the application of the ARDL technique, which is well-suited for analysing relationships among variables with mixed levels of stationarity (I(0) and I(1)). This approach allows for both short-run dynamics and long-run equilibrium analysis within a single framework. Furthermore, the use of quarterly time series data from 2009Q1 to 2022Q4 enhances the study's reliability by capturing important structural changes and policy shifts in Nigeria's banking sector over time. The incorporation of distinct fintech service variables, ATM, Internet Banking, Mobile

Banking, and Point of Sales, adds specificity and depth, enabling targeted insights into the individual effects of each channel on bank performance.

The findings offer useful implications for policymakers, regulators, and bank managers. While POS services enhanced performance, the negative effects from ATM, IB, and MB suggest a need for improved cybersecurity, infrastructure optimisation, and cost management. Fintech's growth should be paired with strategic oversight and tailored investments to boost efficiency. Regulatory policies should also address fraud risks and operational bottlenecks to maximise fintech's potential for improving banking outcomes.

In line with the findings/conclusion made in this study, the following recommendations are put forward:

i. Nigerian banks should invest in advanced security technologies like biometric authentication and real-time fraud detection systems to mitigate ATM fraud risks and enhance customer trust in using these machines, thus enhancing overall performance and reducing risks associated with ATM fraud.

ii. Internet banking has transformed Nigeria's financial landscape, offering convenience and efficiency but also presenting challenges like increased operational costs, cybersecurity threats, customer dissatisfaction, and potential decline in traditional banking services. To improve bank performance, Nigerian banks should invest in robust cybersecurity measures, improve customer support services, and establish strict guidelines for cybersecurity protocols. This includes increasing staff training, implementing multi-channel support options, and providing comprehensive educational resources.

iii. The integration of Point of Sales (POS) services in Nigeria's banking sector has improved financial transactions, customer convenience, and access to banking services. To maintain these benefits, Nigerian government and financial institutions should invest in robust telecommunications infrastructure, ensuring reliable internet connectivity across urban and rural areas. Establishing a clear regulatory framework governing POS operation, including roles for banks, merchants, and payment service providers, is also crucial.

iv. To improve bank performance, the Central Bank of Nigeria should enhance its regulatory frameworks for mobile banking operations, ensuring consumer protection and fair competition. Additionally, promoting financial literacy programs can educate consumers about the benefits and risks of both mobile and traditional banking services.

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