

Electronic Banking and Performance of the Banking Sub-Sector in Nigeria, 2009-2021

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Abstract

This research analyzed electronic banking and performance of the banking sub-sector in Nigeria for the period 2009-2021. The specific objectives of the study were to determine the relationship between transactions made via mobile pay, automated teller machine, point-of-sale, web-pay, electronic banking penetration rate and return on asset of banks in Nigeria. Five banks were selected for the study and these banks were selected based on their gross earnings and ranked as the top 5 banks in Nigeria. The data on electronic banking transactions were sourced from the Central Bank of Nigeria Statistical Bulletin while the performance indicator of the banks (ROA) was sourced from the Annual Audited Financial Statements of the various banks. The data were analyzed using the Panel Random Effect model technique due to the cross-sectional nature of the data. The results revealed that mobile pay and ATM banking services increased the ROA of banks with only ATM increasing the banks' performance indicator significantly. Electronic banking penetration rate increased the banks' ROA significantly for the period reviewed while POS and web/internet banking services decreased the ROA of banks but not significantly. However, the e-banking channels jointly accounted for 77.98 per cent of the changes in the ROA of banks in Nigeria for the period. The conclusion from the findings was that electronic banking services have increasingly enhanced the performance (ROA) of banks in Nigeria most especially mobile and ATM banking channels. E-banking penetration rate has enhanced ROA of banks significantly which suggests that banks have been making significant progress in their profitability ratio given increased access to electronic banking channels. It was recommended among others that, electronic banking channels should be more secure, efficient, strictly monitored, provided with adequate infrastructure with increased access to mobile phone services to return adequate profits to banks using e-banking channels.

Keywords: *Electronic banking, Point of Service, and Automated Teller Machine*

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Background to the Study

Electronic banking entails the processing of inquiries or transactions online without going to the branch concerned (Fozia, 2018). New technology has rapidly transformed the traditional ways of doing banking operations. Before the 1980s, banks in Nigeria engaged in cash/coin banking and cheque/paper banking, which led to the use and emphasis on branch banking. The difficulties associated with branch structure, cash/coin, and cheque/paper banking led to reforms that culminated in electronic banking systems (Oluwatosin, 2017). The innovations and inventions in the field of Information and Communication Technologies (ICTs) facilitated the emergence of electronic banking popularly known as e-banking in the 1980s. The Automated Teller Machine (ATM) was conventionally introduced as an electronic delivery channel in 1989 and was first installed by National Cash Registers (NCR) for the defunct *Societe Generale* Bank of Nigeria (SGBN) in the same year.

Since the structural adjustment programme in 1986, the monetary authorities have adopted various measures aimed at enhancing the banking industry and reducing the strains experienced by customers (Nzotta & Okereke, 2009). To meet the different tastes of customers and to achieve a competitive advantage, banks have over the years, designed, and offered different technology-driven products and services for the market. These are what the CBN (2019) mostly referred to as electronic banking (e-banking) products and services. They include Automated Teller Machines (ATMs), internet banking, web and online transfer of funds, electronic bank statements, bill payment, and mobile telephone banking.

Nigeria fully adopted an electronic banking system in the early 2000s (CBN, 2019). Before 2003, a small number of banks operated their propriety ATM fleets (Oluwatosin, 2017). The National Cash Registers (NCS) installed the very first ATM for the defunct *Societe Generale* Bank back in 1987 and the ATM commenced restricted use in 1989. Fast forward to the early 2000s, developments at home, such as the introduction of the mobile telephone in 2001 and improved access to personal computers and Internet service facilities added to the growth of electronic banking in the country. The main shared ATM network in Nigeria, Inter-switch, began operations in 2003 with 5 ATMs from the United Bank for Africa (UBA) and First Bank of Nigeria (FBN) (Tope, 2010 cited in Onodugo & Ifeanyi, 2015). However, since 2009 when e-banking services became fully open to the public, ATM transactions have averaged N2.5 trillion for the period 2009 to 2021 while mobile pay services averaged N422 billion within the same period (NIBSS, 2021). There is the rapid adoption of other electronic payment services especially point-of-service (POS) and most recently, blockchain technology.

The rapid development in the Information and Communication Technology sector in Nigeria towards the delivery of banking services is sending a strong message about Nigeria's potential to innovate. With a massive explosion of mobile phone penetration since 2003, Nigeria is now considered as the fastest emergent continent in the use of ICT for development amongst developing nations of the world. Recently e-banking has been seen as the powerful energy influencing the landscape of the banking sector fundamentally towards a more competitive industry. Electronic banking has bridged the gap between different financial institutions, enabled new products and services in the financial industry, and made the existing ones

available in different packages (Agbala, 2022). The flexibility, speed, accessibility, and convenience of Electronic Banking have made it very popular and widely embraced by the people. In 2017, the Central Bank of Nigeria introduced a cashless economic policy wherein financial transactions are primarily carried out electronically between customers and banks as a means of driving national economic growth. As a result, the total volume and value of transactions carried out on each of the e-payment channels from 2012 to 2020 by all the banks in Nigeria are summarized below:

Table 1: Volume and Value E-banking Channels in Nigeria (2012-2020)

S/N	Year (2012-2020)	Volume	Value (Naira)
1.	Automated Clearing System (ACS) Cheques	77,652,000	N39.9Trillion
2.	NIBSS Electronic Fund Transfer (NEFT)	170,868,138	N82.3 Trillion
3.	Automated Teller Machine (ATM)	2,895,863,700	N23.9 Trillion
4.	Point of Sales (POS)	276,531,743	N3.1Trillion
5.	Internet (Web)	61,803,981	N561.6Billion
6.	Mobile Money Operations (MMO)	184,759,280	N2.8 Trillion
7.	NIBSS Instant Payment (NIP)	658,102,383	N154.5Trillion
8.	e-Bills Pay	3,727,526	N1.1Trillion

Source: Central Bank of Nigeria (2020)

Given the electronic banking statistics above, we see that for the same period, Guarantee Trust Bank recorded returns on assets of 3.72 while Zenith Bank's ROA was 3.14. First Bank was 3.12, and the United Bank for Africa (UBA) posted an ROA of 2.87 (The Banker, 2022). These e-banking service channels portray a clear picture of how Nigerians have embraced electronic banking since its inception fully in 2012 and how banks have raised their ROA through various e-banking service channels. The main thrust of this research work, therefore, is to analyze electronic banking channels and how they affect the performance of the banking sub-sector in Nigeria.

Statement of the Problem

In Nigeria, transactions made using ATMs reached N10 trillion at the end of the year 2021 while POS transactions totaled N4.8 trillion for the same year (CBN, 2021). For the same year 2021, web-pay was valued at N500 billion. NIBSS (2021) released the annual payments statistics for the year ended 2021 and banks' assets were put at N237.9 trillion while banks' density was 6,918 per 100,000 population (CBN, 2021). Given these statistics, the main motivation for this study is the relationship between these electronic banking statistics and the performance of the banking sub-sector in Nigeria.

Agbala (2022), observed that despite the benefits accruable to electronic banking services, it is yet to gain acceptance on a wide scale, especially in developing countries and the adoption level is marginally insignificant. At the inception of electronic banking, several stakeholders thought that the system would work easily for deposit money banks especially since most of the transactions went through mobile phones. Numerous researchers deployed their tools to find out the nexus between electronic banking and banking sub-sector performance. It is

crystal clear therefore, that the myriad of works linking electronic banking and banking industry performance such as Fozia, (2018), Amiri, (2012), Ashiru et al (2023), Adu and Williams (2023), etc, studied only one aspect of electronic banking which is mobile banking. Other studies were focused on electronic banking and customer service delivery and satisfaction (Abubakar and Tasmin, 2012; Ahmed, Yaser, and Bashar, 2015; Farouk and Saheed, 2018, etc.). However, none of these previous studies perused electronic banking from the standpoint of the value of the various e-banking channels and how they affect the financial performance of banks in Nigeria otherwise known as the return on assets. The problem of non-adoption of all the electronic banking channels and non-consideration of e-banking penetration rate as explanatory variables in economic literature pose a dire need for research that will address this need.

Objectives of the Study

The main objective of the study is to analyze electronic banking and its effect on the performance of the banking sub-sector in Nigeria. The specific objectives are to;

1. Determine the relationship between mobile pay banking and the performance of the sub-sector in Nigeria.
2. Analyze the effect of automated teller machine transactions on the performance of the banking sub-sector in Nigeria.
3. Analyze point-of-sale (POS) banking services and how it has affected the performance of the banking sub-sector in Nigeria.
4. Ascertain the effect of transactions made through web pay on the performance of the banking sub-sector in Nigeria,
5. Find the relationship between e-banking penetration rate and banks' performance in Nigeria.

Research Questions

The following questions arise from the objectives, which serve as a further guide to the study:

1. What is the relationship between mobile pay banking services and the performance of banks in Nigeria?
2. What effect do automated teller machine transactions have on the performance of banks in Nigeria?
3. What is the relationship between transactions made through point-of-sale (POS) banking services and the performance of banks in Nigeria?
4. What effect do web pay banking services have on the performance of banks in Nigeria?
5. What is the relationship between e-banking penetration rate and banks' performance in Nigeria?

Research Hypotheses

H01: There is no significant effect of mobile pay banking services on the performance of banks in Nigeria.

H02: Transactions made through automated teller machines have no significant effect on the performance of banks in Nigeria.

H03: There is no significant relationship between point-of-sale (POS) banking services and

the performance of banks in Nigeria.

H04: Web pay banking services have no significant effect on the performance of banks in Nigeria.

H05: There is no significant effect of e-banking penetration rate on banks' performance in Nigeria.

Scope of the Study

The unit scope of this study is electronic banking and its effect on banking sub-sector performance in Nigeria. The scope covers the top five (5) deposit money banks in Nigeria (based on market capitalization) as captured in the Central Bank publication for 2021. They include:

1. FBN Holdings
2. United Bank for Africa
3. Guarantee Trust Bank
4. Access Bank
5. Zenith Bank

These banks posted a combined market capitalization of ₦4.5 trillion for the year ended 2022. Individual analysis of the bank's gross earnings shows that Access Holdings recorded the highest gross earnings amounting to ₦1.4 trillion. Zenith Bank followed with ₦945.5 billion. UBA ranked third with a gross earning of ₦853 billion. FBN Holdings trailed with ₦748.6 billion while Guarantee Trust Bank recorded ₦447.8 billion in 2022 (CBN, 2022).

The variable scope of this study includes the value of transactions made on automated teller machines, point-of-sale, web pay, and mobile payment systems. These will serve as the independent variables. The performance of the selected banks is measuring their return on assets (ROA) which is the ratio of gross profit to assets. Since this study is cross-sectional, the time scope is from 2009: Q1 through 2021: Q4 covering the quarterly e-banking statistics from the selected banks.

Theoretical Literature Review

Theory of Financial Inclusion

The International Monetary Fund (IMF) theorized in the early 2000s that financial intermediation has advanced to the level of reaching the rural unbanked and making banking services universal which can equally help to advance the objective of banking which is to increase profitability and at the same time enhancing access to financial services. The International Monetary Fund (IMF) hypothesized that there is a need to make financial services to reach the unreached and the unbanked. The importance of financial inclusion for long-term growth has pushed the agenda of financial inclusion forward (Amidžić, Massara & Mialou, 2014).

The theoretical position of the IMF is that financial services should be promoted at the rural level through the offering of electronic banking services through agent banking. This, according to the agency will make the unbanked to be on a decreasing trend in most rural

communities. The promotion of financial inclusion through its engagement with financial institutions and intermediaries will aid financial intermediation. The Financial inclusion theory stresses the access by enterprises and households to reasonably priced and appropriate formal financial services that meet the needs of enterprises and households (World Bank, 2000). Financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs, transactions, payments, savings credits, and insurance- delivered responsibly and sustainably (World Bank, 2000). It follows that persons who do not have access to banking services are regarded as financially excluded. This brings us to the concept of financial exclusion. The World Bank identified two types of financial exclusion namely.

1. Voluntary (or self-exclusion) and
2. Involuntary exclusion

Voluntary exclusion refers to people who do not identify their need for financial services or choose to remain outside of the financial system due to cultural or religious considerations. Involuntary exclusion refers to exclusion due to insufficient income, discrimination, lack of information, price barriers, etc. (World Bank, 2014). In developing countries, the security concern of ordinary people carrying cash has become an additional motivation to address the financial exclusion of the vast unbanked sector. Globally, the World Bank estimates that two billion people, of whom more than half are adults, do not have a bank account. In Africa, only one in four persons have a bank account, but eight in ten have access to a mobile phone.

Empirical studies found that emphasis on the financial inclusion hypothesis can alleviate poverty, reduce income inequality, and increase the wealth of the low-income population (Levine, 1998; Demirgüç-Kunt & Klapper, 2012; Honohan, 2008). The growing evidence of the benefits to individuals of financial inclusion, especially having a bank account provides an economic and political rationale for governments and policymakers to promote financial inclusion (Klapper & Singer, 2015; Allen *et al.* 2016). Swamy (2014) stated that access to safe, easy, and affordable credit and other financial services by the poor and vulnerable groups, disadvantaged areas, and lagging sectors is recognized as a pre-condition for accelerating growth and reducing income disparities and poverty.

Despite the growing evidence on the benefits of financial inclusion, differences remain in the optimal policies to promote both financial and economic development. On the practical side, there is mounting global interest by donors, governments, regulators, banking, and the commercial sectors in the use of mobile technologies to deliver financial services to emerging economies. Porteous (2006) pointed out that there are four main categories of mobile banking business models:

- i. Bank-led,
- ii. Telecom-led,
- iii. Independent non-telecom and
- iv. Non-bank agents, and any combination or hybrid of bank and non-bank partnerships.

The type of business model employed is determined mainly by the regulatory framework in that country. In Nigeria, the practice is the hybrid model. Bank and non-bank-led model of mobile money services is typically regulated by strict banking regulations in addition to regulation by the telecom's regulators. The regulation is normally driven by the government's definition of e-money and therefore the regulation of mobile money. Mobile network operators provide the network infrastructure required for mobile payments, thus providing convenience to customers and ease of use. Mobile banking can leverage the existing mobile telecommunication networks to provide financial services to the previously unbanked. Financial institutions have also launched their mobile applications by entering partnerships with mobile networks to provide financial services. Electronic banking can overcome the high costs associated with fixed-line telecommunication networks, as there are lower costs for building infrastructure, and lower costs associated with the development, provision, and use of the services.

Therefore, this theory upholds the fact that banks are pioneering the use of mobile and technological innovations to address financial inclusion (Alliance for Financial Inclusion 2011). Accordingly, the profit accruable to banks should be on a positive trend with the increase in electronic banking channels and the addition of more people into the banking system. Banks now have access to investible funds. These funds are invested, and ROI is earned. The Central Bank of Nigeria recently released a bank profitability statement, and the statistics show that the financial inclusion theory strongly holds good fortunes for the banking sub-sector in Nigeria. For instance, NIBSS (2021) released a statement noting that Zenith and Guarantee Trust bank have the largest point-of-service and ATM networks in Nigeria and these two banks posted profits reaching 594 million US dollars and 425 million US dollars respectively making them the leading banks in the country in terms of ROA. This is a clear indication of the potency of the financial inclusion theory on banks' performance.

Technology Acceptance Model (TAM)

The theory of the Technology Acceptance Model (TAM) was postulated by Fred Davis in 1986 and is specifically tailored toward modeling users' acceptance of information systems or technologies. The theory states that users of technology come to accept and use a new technology. By undergoing three stages whereby external factors trigger cognitive responses which in turn form an effective response which makes them make use of the technology. The introduction of Information Communication Technology (ICT) changed the way individuals and organizations carry out different activities. It has allowed customers to access and perform several financial and banking transactions on their bank accounts from their computers at any time. Technological innovations no doubt, pose several challenges to institutions and organizations ranging from the user's willingness to accept and use available systems and the pressing need to meet up with the trend of customer service delivery.

Davis (1989), in a study, on perceived usefulness, perceived ease of use, and user acceptance of information technology, utilized the definitions of these variables to regress for reliability and construct validity in two studies involving a total of 152 users and four application programs. In both studies, usefulness had a significantly greater correlation with usage behavior than did

ease of use. The result of the regression analysis suggests that perceived ease of use may be a causal antecedent to perceived usefulness, as opposed to a parallel direct determinant of system usage. This theory came into existence after the financial intermediation theory in 1960. However, with the modifications of the financial intermediation theory by Andriein 2009, other aspects of the theory were studied including the role of technology in advancing financial intermediation and, thus, the relevance of the TAM model.

Davis (1989), also citing Robey (1979) agreed that a system that does not help people perform their job is not likely to be received favorably. The model suggests that when users are presented with a new technology, several factors influence their decision about how and when they will use it.

1. **Perceived usefulness (PU):** This according to Freed Davis is, “the degree to which a person believes that using a particular system will enhance his or her job performance”. It refers to the perception of whether or not a technology will be useful for what someone wants to do.
2. **Perceived Ease of Use (PEOU):** This was defined as “the degree to which a person believes that using a particular system would be free from effort”, (Davis, 1989). This therefore means that if the technology is easy to use, then the barrier is conquered, but where it is not easy to use and the inter-phase is complicated, no one has a positive attitude towards it.

Other external variables such as social influence was also identified as an important factor in determining the attitude. People's attitudes influence their intention to use technology. Perception may also differ depending on age and gender.

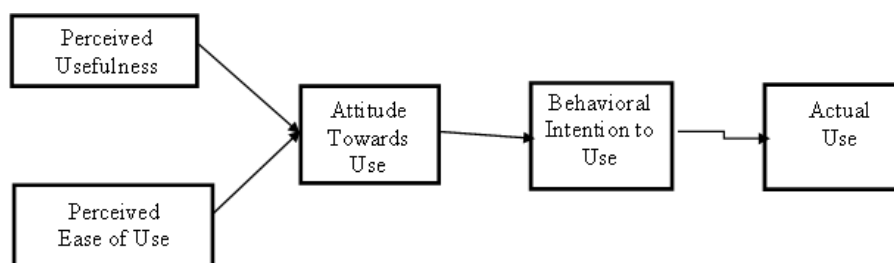


Fig. 1: Technology Acceptance Model (TAM), (Source: Davis, 1989).

A new model, theory of plan behavior (TPB) was combined with TAM, (TAM-TPB) and was proposed by Taylor & Todd (1995). Venkatesh and Davis, (2000) also proposed a new version of TAM called TAM 2, which added new variables to the existing model. Priyanka (2012) in a study, Technology Acceptance Model: A Survey of Literature, identified that Lim (2000) proposed to modify TAM by adding variables like experience, self-efficacy, perceived risk, and social influence. Also, Priyanka (2012) agreed with Franco and Roldan (2005) that the relationship between perceived usefulness and behavioral intention was strong among goal-directed users. Lee (2009) also combined TAM with TPB, perceived risk, and perceived benefit to understand the adoption of Internet Banking. TAM has been utilized by many researchers

to understand the acceptance of different types of information systems as they aid service delivery. The TAM model has been modified to include more variables that made it more robust. It has therefore been useful, especially in the understanding of the user behavior of information technology systems.

In the context of this study, both the banking sub-sector and the customers are the users of electronic banking channels (technology). This means that the level of acceptance of the technology depends on the effectiveness of its deployment by banks. Thus, the acceptance of any electronic banking service is predicted by the users' behavior intention, which is in turn, determined by the perception of technology usefulness in performing the task. There are two scenarios in this case. Firstly, the perceived usefulness of the e-banking channel is what will inform the attitude and behavioral patterns of the customers. Secondly, the banks perceived the ease of use of the e-banking channels as a way of growing their profits.

This research is therefore hinged on the financial inclusion theory and the Technology Acceptance Model (TAM). As earlier explained, TAM is an information systems theory that models how people come to accept a new policy and use technology that has the potential to enhance the performance of banks. TAM is one of the models that have been developed to provide a better understanding of the usage and adoption of technology which is the base of electronic banking. It is presently a prominent theory used in modeling technology acceptance and adoption in information systems research. The model suggests that when people or institutions are presented with a new technology, several factors influence their decision about how and when they will use it. The factors are; perceived usefulness (PU) and perceived ease of use (PEOU). According to TAM, one's actual use of a technology system is influenced directly or indirectly by the user's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease of the system. Similarly, the financial inclusion theory upholds the universality of banks and the spread of banking services to rural areas. Embedding technology in banking helps to drive this objective and the ease of acceptance of technology by both the banks and the customers makes financial inclusion seamless and easy for banks. It follows that when banking services are well spread and well accepted because of their perceived benefits, the performance of banks will be enhanced in the long run.

Empirical Literature Review

Mobile pay banking services and performance of the banking industry

Okon and Amaegberi (2019) estimated the impact of mobile banking transactions on bank profitability in Nigeria using selected bank data from the Electronic Payment System Office, Central Bank of Nigeria Statistical Bulletin from 2007-2016. The study adopted the Panel unit root and SURE model estimation technique to conduct quantitative analysis for four selected old and new-generation banks. Their results were analyzed using economic a priori criteria, statistical criteria, and econometric criteria. The positive and statistically significant relationship between mobile banking of old and new generation banks in Nigeria indicated that mobile banking is a major factor that contributes to old and new banks' performance in Nigeria. The study recommended that banks should intensify efforts to increase the assets of banks in Nigeria to make more profit. The study also calls for efficient management and utilization of funds to train and evaluate bank workers at every point in time.

Eze and Egoro (2020) studied the impact of electronic banking on the profitability of commercial banks in Nigeria. The study sought to examine the relationship between different e-banking channels and the profitability of commercial banks in Nigeria. Four e-banking channels (automatic teller machines, electronic mobile banking, internet banking transactions, and point of sales services) were identified and regressed against the profit before tax of commercial banks operating in Nigeria between 2006 and 2014. The study used the confirmed ECM model (via residual diagnosis) to test the formulated hypotheses. The results revealed that the impact of electronic banking on the profitability of commercial banks was significant, whereas the impact of the individual channels was varied. The study recommended, amongst others that, commercial banks should intensify efforts to deploy more mobile banking services delivery points and also make them more effective and efficient and that the regulatory authorities should also collaborate with the banks to put in place an enabling operating environment and regulatory framework to bring out optimal deployment of these services to customers. This is especially true concerning addressing the issue of failed transactions.

Noopur, Navneet, and Mayor, (2022), examined the most important factors influencing and impeding consumer adoption of mobile banking. This study used the unified theory of acceptance and use of technology readiness as a theoretical basis and integrated it with cognitive resistance to propose a conceptual model for mobile banking adoption in India. Data was collected from 536 mobile banking customers from Delhi/NCR, using convenience sampling, and was analyzed using structural equation modeling. The findings revealed that the impact of facilitating factors namely, performance expectancy, effort expectancy, social influence, optimism, and innovativeness on behavioural intention to use mobile banking is much more than the impact of inhibiting factors, namely, discomfort, insecurity, and cognitive resistance and also that behavioural intention has a significant impact on the adoption of mobile banking.

Cho, Lee, Hwang, and Kim (2023) microscopically compared the effects of bank branch closures and changes in net profit using a time-series analysis. Specifically, they quantitatively analyzed actual customer attrition behavior with a time-series analysis across the three quarters before and after the closure of 88 branches of major commercial banks in South Korea in the Seoul metropolitan area and nearby cities. The findings proved that branch closures and multi-channel effects in the financial sector were gradually being resolved through immediate technology acceptance, contrary to popular concern.

Automated teller machine transactions and performance of banks

Ali and Kalu (2019), evaluated the impact of ATMs on the banking service delivery in Nigeria using descriptive and regression analyses on the value of ATM transactions and customer deposit series for the sample period ranging from January 2009 to December 2013. The results of descriptive statistics showed that private-sector saving deposits and private-sector demand deposit series were normally distributed but the private-sector time deposits and the value of ATM transactions were not normally distributed. The results of the ADF unit root tests showed that the levels of the variables contain unit roots whereas their first differences do not

contain unit roots. The regression results indicated that ATM transactions positively and significantly impact private sector demand deposits in Nigeria but not private sector savings deposits and private sector time deposits. They recommended that the monetary authorities and commercial banks enlighten the depositors on the usage of ATMs through mass media such as television, billboards, and radio as well as paste directive posters at every ATM center across the country.

Ong'Era and Omagwa (2021), examined the role of automated teller machines on the performance of commercial banks in Kenya. The study was conducted in July 2016 and focused on selected commercial banks, that is, Equity Bank Kenya Limited, Co-operative Bank of Kenya Limited, KCB Bank Kenya Limited, and Family Bank Kenya Limited. The researcher used a descriptive research design. The study adopted purposive sampling whereby respondents were targeted and provided the information that was required. The study used both primary and secondary data. Primary data was collected using a questionnaire, while secondary data was collected from the audited financial statements over 5 years (2011-2015). Statistical Package for Social Sciences (SPSS) version 22 was used for purposes of analysis. Data was analyzed using descriptive statistics (Means, percentages, and standard deviation) as well as regression analysis. The study revealed that automated teller machines influence the financial performance of the four commercial banks in Kenya. The study also found that automated teller machines provide services at low cost and are affordable and convenient, which increases utilization by customers and hence increases in revenue and profitability of the banks. They suggested that to increase the utilization of automated teller machines, commercial banks should increase the number of automated teller machines in the country.

Ulaya, Kiwia, and Rahul (2023) investigated the effects of ATM technology on the performance of banks in Tanzania. The study was conducted on a sample of 125 bank employees in Da res Salaam City. The results of the study were analyzed using the SPSS software package and the chi-square technique. Although the implementation of ATM terminals has generally been beneficial for banks in Tanzania, it has also been associated with higher fraud rates. The quality of service provided by ATMs was not related to the privacy and security of its users or providers. Therefore, they suggested that banks should enhance their security measures to prevent web scammers from infiltrating their customers' accounts.

Abibual, Atinkugn, and Getnet, (2023) examined the effects of Automated Teller Machine Service Quality on customer satisfaction in Commercial Banks in Ethiopia. Cross-sectional data were collected through a Questionnaire from a sample of three hundred and forty-six users of the Automated Teller Machine selected from Semera-logia City, Asyatia, and Awash Town respectively. To identify the dimensions of Automated Teller Machine service quality and their relationship with customer satisfaction, confirmatory factor analysis and structural equation modeling through SPSS and AMOS 23.0 data analysis software were used. The findings indicate that convenience, reliability, ease of use, fulfillment, and security/privacy of Automated Teller Machine service quality dimensions are positively and significantly associated with customer satisfaction. The result of this study can help banks' management improve the quality of their ATM services to increase customer satisfaction.

Point-of-Service (POS) Banking Services and Performance of Banks

Arseculeratne (2019), studied the impact of digital banking on banks' profitability: study on the Sri Lankan banking industry. The research analyzed quarterly data from year 2010 to 2018. Data were obtained from the Payment and Settlement Department of the Central Bank of Sri Lanka and the Central Bank website. Bank performance was identified by the return on assets (ROA) before tax. From the number of digital banking aspects, the variables used in this study were the number of Internet banking transactions, the number of point-of-sale (POS) machine transactions, and the number of mobile banking transactions (MOBT). Time effectiveness and the cost-effectiveness of digital banking were discussed in the study. Augmented Dickey-Fuller Test was used to check the stationarity of the variables. Since the stationarity test revealed that all four variables become stationary at the 1st difference, cointegration of the variables was drawn through the Johansen Cointegration Test. The trace test indicated four cointegration equations and the Max-Eigen Statistic test indicated only one cointegration equation at the 5% level. Hence Vector Error Correction Model (VECM) was fitted to determine the long-run equilibrium. The model showed that there exists a very stable long-run association. The Impulse Response Function was employed to illustrate the importance of each digital banking aspect to banking sector profitability when a shock is imposed on the system. The study observed that POS transactions affect profitability positively, while Internet banking and mobile banking showed a negative impact on profitability. In the short run, internet banking and POS transactions showed an association with profitability.

Sujud and Hashem (2020) studied bank innovations in the fields of mobile banking, debit, and credit cards, automated machines (ATM), internet banking, point of sale terminals (PST), and electronic funds transfer (EFT). They purposely investigated those innovations in relation to their influence on the profitability and return on assets (ROA) of Lebanese commercial banks. Data was collected through a research questionnaire, and statistical analysis was done using the Package of Social Sciences Software (SPSS). The results revealed a significant positive impact of bank innovations on profitability and return on assets of Lebanese commercial banks and significance tests also showed that the impact was statistically significant. Based on the results of the study, the study concluded that bank innovations affect the profitability and return on assets (ROA) of commercial banks in Lebanon positively.

Ozaji, et al, (2021) examined the effect of point of sale (POS) transactions on the security of banking transactions in the Nigerian economy. The study used an ex-post facto research design and secondary data sources, analyzing aggregate quarterly data from all deposit money banks operating in Nigeria from 2012 to 2019. Error Correction Model estimation and Autoregressive Distributed Lag model estimation were used to test hypotheses after conducting the Augmented Dickey-Fuller Unit Root Test and co-integration test. The results showed that the introduction of cashless banking through POS transactions in Nigeria had not significantly affected the number of fraud and forgery cases in deposit money banks but had significantly impacted the amount involved in attempted or reported fraud and forgery. The study also found that cashless banking via POS transactions had not significantly affected actual losses due to fraud and forgery.

On the other hand, Okonkwo and Ekwueme (2022) conducted a study to determine the impact of the POS payment method on the financial performance of deposit money banks in Nigeria. Adopting an ex post facto research design, the authors sampled 13 deposit money banks out of the 22 banks operating in the country and collected data from the CBN Statistical bulletin and annual reports of the sampled banks for the period from 2009 to 2019. Regression analysis was performed using E-Views 9.0 statistical software. The results showed that the POS payment method had a negative effect on the return on assets of quoted deposit money banks in Nigeria, though this effect was not statistically significant at the 5% level of significance. The authors suggest that banks should host seminars and workshops to educate clients and merchants about the advantages of the POS payment method.

Web Pay and Banks' Performance

With the help of questionnaires, Mensah et al. (2019) investigated the impact of financial innovations on the financial performance of selected Ghanaian banks in terms of income or revenue generation, efficiency, liquidity, profitability, and general patronage of banking services. They found that financial innovations have ushered in Internet banking, which has been efficient with web pay and other services. These services have enhanced the profit ratio of banks. They recommended that corporate banks make it a policy to build an efficient and successful marketing department as part of their strategic management process to oversee the publicity of all financial innovation products.

Ashiru, Balogun, and Paseda (2023), investigated the impact of Internet banking on banks' financial performance. Schumpeter's Theory of Innovation Diffusion and constraint-induced financial innovation theories were the theoretical foundations of the study. Utilizing data for the 2012 to 2021 period because of data availability, they consider the causal effect of innovation on commercial bank performance via the Granger causality test. The entire 24 deposit money banks in Nigeria constituted the study's population. Secondary data were gathered over the study period from NDIC annual reports, the Nigeria Inter-Bank Settlement System (NIBSS), and the Central Bank of Nigeria statistical bulletins (2012–2021). Based on the ARDL model analysis, POS banking service had the greatest impact on deposit money bank performance because of the large volume and value of transactions witnessed in the banking sector. Thus, they suggested that more mobile and e-banking services should be made available. The usage of ATMs, mobile banking, credit and debit cards, online banking, and agency banking had positive short-run and long-run substantial effects on deposit money bank performance in Nigeria, except National Electronic Fund Transfer (NEFT) and NIBSS Instant Payments (NIP) according to empirical results.

Adepoju, Banji, and Ehijiele (2021), investigated web payment techniques being a financial technology innovation, and its impact on banks' performance in Nigeria. The study adopted an ex-post-facto research design with a time series collected on a quarterly basis covering a period from 2009 to 2020. The entirety of the study was 21 deposit money banks quoted on the Nigerian stock exchange. Data collected were obtained from the Central Bank Statistical Bulletin and analyzed with the Error Correction Model (ECM). The study revealed that web payment by way of electronic banking has a significant influence and is positively related to

bank financial performance, suggesting that there were cogent technological changes and factors enhancing bank performance. The study has provided some useful insights into factors that can continue to enhance the influence of the nexus between web payment electronic banking and banks' performance.

Ekpo, Okereke, and Onyemere, (2023) examined the effect of electronic payment systems on the performance of the Nigerian banking industry. The electronic payment systems considered were automated teller machines, point of sale, mobile payment technology, and internet or web-assisted payment medium on the bank performance indicator or return on assets. The study used quarterly frequency data from 2010Q1 to 2019Q4 and the static and dynamic models were estimated using the autoregressive distributed lag (ARDL) method. The stability of the series was tested using the augmented dickey-fuller and the bound test method was employed in testing for the co-integrating relationship among the interest variables from the bound test, the study discovered common trend movement among the variables of interest. The long-run result indicated that the usage of mobile phone technology and point of sale increases bank performance but is only insignificant. In addition, the increased use of automated teller machines and web payment mediums insignificantly causes a decline in the performance of banks in Nigeria. These results indicated that the performance of the Nigerian banking industry is unaffected by the use of electronic payment systems. Following these results, it was recommended that banks invest in improving the speed, carrying capacity, and accuracy of the payment systems.

Research Design

This research adopted the *ex-post-facto* research design. The researcher opted for this design approach because we intend to use secondary data to achieve our specific objectives. The *ex-post-facto* design is a quasi-experimental study that examines how an independent variable affects a dependent variable. A quasi-experimental study simply means that the variables studied are not randomly assigned and that the observations have been made and kept for reference and inferential purposes. For this study, the design involved gathering time series data that have cross-sectional properties i.e. data from five different banks, and subjecting the time series data to econometric analysis of unit root, cointegration, and panel model estimation.

Methods of Data Analysis

The study adopted the Least Squares (LS) method of analysis within the panel fixed and random effects regression model. The fixed effect model is considered more appropriate than the random effect model if the evidence from the results of the Hausman (1978) Specification test gives us a significant result (Chen, 2009). To deal with heterogeneity, panel data is an effective and appropriate way because; the data is more informative, there is higher variability, co-linearity is low or no co-linearity is present, and the degree of freedom and the efficiency are higher respectively (Chen, 2009).

Test of Hypotheses

The hypotheses test is based on the RE t-statistic values and their respective probability values. The overall significance of the individual variables is also tested using the F-statistic to give a general report of the test of hypotheses. The t-test is summarized as follows:

Table 2: Test of Hypotheses

Hypotheses I	Variables	t-stat.	p-value	Decision
H ₀₁ : There is no significant effect of mobile pay banking services on the performance of the banks in Nigeria.	MOB	0.44207	0.6600 > 0.05	The <i>p-value</i> is not significant therefore, we accept the null hypothesis and conclude that there is no significant effect of mobile banking on banks' performance.
Hypotheses II	Variables	t-stat.	p-value	Decision
H ₀₂ : Transactions made through automated teller machine have no significant effect on the performance of banks in Nigeria.	ATM	2.5680	0.0127 < 0.05	The <i>p-value</i> is significant therefore; we reject the null hypothesis and conclude that ATM transactions significantly affect banks' performance.
Hypotheses III	Variables	t-stat.	p-value	Decision
H ₀₃ : There is no significant relationship between point-of-service (POS) banking services and performance of banks in Nigeria.	POS	-0.4423	0.6598 > 0.05	The <i>p-value</i> is not significant therefore, we accept the null hypothesis and conclude that there is no significant relationship between POS and banks' performance.
Hypotheses IV	Variables	t-stat.	p-value	Decision
H ₀₄ : Web pay banking services have no significant effect on the performance of banks in Nigeria.	WEB	-0.3285	0.7437 > 0.05	The <i>p-value</i> is not significant therefore, we accept the null hypothesis and conclude that web pay banking services have no significant effect on banks' performance.
Hypotheses IV	Variables	t-stat.	p-value	Decision
H ₀₅ : There is no significant effect of e-banking penetration rate on banks' performance in Nigeria.	EBP	4.1993	0.0001 < 0.05	The <i>p-value</i> is significant therefore; we reject the null hypothesis and conclude that there is significant effect of e-banking penetration rate on banks' performance.

Source: Extracted from E-views Output (See Appendix)

A new model, theory of plan behavior (TPB) was combined with TAM, (TAM-TPB) and was proposed by Taylor & Todd (1995). Venkatesh and Davis, (2000) also proposed a new version of TAM called TAM 2, which added new variables to the existing model. Priyanka (2012) in a study, Technology Acceptance Model: A Survey of Literature, identified that Lim (2000) proposed to modify TAM by adding variables like experience, self-efficacy, perceived risk, and

social influence. Also, Priyanka (2012) agreed with Franco and Roldan (2005) that the relationship between perceived usefulness and behavioral intention was strong among goal-directed users. Lee (2009) also combined TAM with TPB, perceived risk, and perceived benefit to understand the adoption of Internet Banking. TAM has been utilized by many researchers to understand the acceptance of different types of information systems as they aid service delivery. The TAM model has been modified to include more variables that made it more robust. It has therefore been useful, especially in the understanding of the user behavior of information technology systems.

In the context of this study, both the banking sub-sector and the customers are the users of electronic banking channels (technology). This means that the level of acceptance of the technology depends on the effectiveness of its deployment by banks. Thus, the acceptance of any electronic banking service is predicted by the users' behavior intention, which is in turn, determined by the perception of technology usefulness in performing the task. There are two scenarios in this case. Firstly, the perceived usefulness of the e-banking channel is what will inform the attitude and behavioral patterns of the customers. Secondly, the banks perceived the ease of use of the e-banking channels as a way of growing their profits.

This research is therefore hinged on the financial inclusion theory and the Technology Acceptance Model (TAM). As earlier explained, TAM is an information systems theory that models how people come to accept a new policy and use technology that has the potential to enhance the performance of banks. TAM is one of the models that have been developed to provide a better understanding of the usage and adoption of technology which is the base of electronic banking. It is presently a prominent theory used in modeling technology acceptance and adoption in information systems research.

The model suggests that when people or institutions are presented with a new technology, several factors influence their decision about how and when they will use it. The factors are; perceived usefulness (PU) and perceived ease of use (PEOU). According to TAM, one's actual use of a technology system is influenced directly or indirectly by the user's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease of the system. Similarly, the financial inclusion theory upholds the universality of banks and the spread of banking services to rural areas. Embedding technology in banking helps to drive this objective and the ease of acceptance of technology by both the banks and the customers makes financial inclusion seamless and easy for banks. It follows that when banking services are well spread and well accepted because of their perceived benefits, the performance of banks will be enhanced in the long run.

Empirical Literature Review

Mobile pay banking services and performance of the banking industry

Okon and Amaegberi (2019), estimated the impact of mobile banking transactions on bank profitability in Nigeria using selected bank data from the Electronic Payment System Office, Central Bank of Nigeria Statistical Bulletin from 2007-2016. The study adopted the Panel unit root and SURE model estimation technique to conduct quantitative analysis for four selected

old and new-generation banks. Their results were analyzed using economic a priori criteria, statistical criteria, and econometric criteria. The positive and statistically significant relationship between mobile banking of old and new generation banks in Nigeria indicated that mobile banking is a major factor that contributes to old and new banks' performance in Nigeria. The study recommended that banks should intensify efforts to increase the assets of banks in Nigeria to make more profit. The study also calls for efficient management and utilization of funds to train and evaluate bank workers at every point in time.

Eze and Egoro (2020) studied the impact of electronic banking on the profitability of commercial banks in Nigeria. The study sought to examine the relationship between different e-banking channels and the profitability of commercial banks in Nigeria. Four e-banking channels (automatic teller machines, electronic mobile banking, internet banking transactions, and point of sales services) were identified and regressed against the profit before tax of commercial banks operating in Nigeria between 2006 and 2014. The study used the confirmed ECM model (via residual diagnosis) to test the formulated hypotheses. The results revealed that the impact of electronic banking on the profitability of commercial banks was significant, whereas the impact of the individual channels was varied. The study recommended, amongst others that, commercial banks should intensify efforts to deploy more mobile banking services delivery points and also make them more effective and efficient and that the regulatory authorities should also collaborate with the banks to put in place an enabling operating environment and regulatory framework to bring out optimal deployment of these services to customers. This is especially true concerning addressing the issue of failed transactions.

Noopur, Navneet, and Mayor, (2022), examined the most important factors influencing and impeding consumer adoption of mobile banking. This study used the unified theory of acceptance and use of technology readiness as a theoretical basis and integrated it with cognitive resistance to propose a conceptual model for mobile banking adoption in India. Data was collected from 536 mobile banking customers from Delhi/NCR, using convenience sampling, and was analyzed using structural equation modeling. The findings revealed that the impact of facilitating factors namely, performance expectancy, effort expectancy, social influence, optimism, and innovativeness on behavioural intention to use mobile banking is much more than the impact of inhibiting factors, namely, discomfort, insecurity, and cognitive resistance and also that behavioural intention has a significant impact on the adoption of mobile banking.

Cho, Lee, Hwang, and Kim (2023) microscopically compared the effects of bank branch closures and changes in net profit using a time-series analysis. Specifically, they quantitatively analyzed actual customer attrition behavior with a time-series analysis across the three quarters before and after the closure of 88 branches of major commercial banks in South Korea in the Seoul metropolitan area and nearby cities. The findings proved that branch closures and multi-channel effects in the financial sector were gradually being resolved through immediate technology acceptance, contrary to popular concern.

Automated teller machine transactions and performance of banks

Ali and Kalu (2019), evaluated the impact of ATMs on the banking service delivery in Nigeria using descriptive and regression analyses on the value of ATM transactions and customer deposit series for the sample period ranging from January 2009 to December 2013. The results of descriptive statistics showed that private-sector saving deposits and private-sector demand deposit series were normally distributed but the private-sector time deposits and the value of ATM transactions were not normally distributed. The results of the ADF unit root tests showed that the levels of the variables contain unit roots whereas their first differences do not contain unit roots. The regression results indicated that ATM transactions positively and significantly impact private sector demand deposits in Nigeria but not private sector savings deposits and private sector time deposits. They recommended that the monetary authorities and commercial banks enlighten the depositors on the usage of ATMs through mass media such as television, billboards, and radio as well as paste directive posters at every ATM center across the country.

Ong'era and Omagwa (2021), examined the role of automated teller machines on the performance of commercial banks in Kenya. The study was conducted in July 2016 and focused on selected commercial banks, that is, Equity Bank Kenya Limited, Co-operative Bank of Kenya Limited, KCB Bank Kenya Limited, and Family Bank Kenya Limited. The researcher used a descriptive research design. The study adopted purposive sampling whereby respondents were targeted and provided the information that was required. The study used both primary and secondary data. Primary data was collected using a questionnaire, while secondary data was collected from the audited financial statements over 5 years (2011-2015). Statistical Package for Social Sciences (SPSS) version 22 was used for purposes of analysis. Data was analyzed using descriptive statistics (Means, percentages, and standard deviation) as well as regression analysis. The study revealed that automated teller machines influence the financial performance of the four commercial banks in Kenya. The study also found that automated teller machines provide services at low cost and are affordable and convenient, which increases utilization by customers and hence increases in revenue and profitability of the banks. They suggested that to increase the utilization of automated teller machines, commercial banks should increase the number of automated teller machines in the country.

Ulaya, Kiwia, and Rahul (2023), investigated the effects of ATM technology on the performance of banks in Tanzania. The study was conducted on a sample of 125 bank employees in Da res Salaam City. The results of the study were analyzed using the SPSS software package and the chi-square technique. Although the implementation of ATM terminals has generally been beneficial for banks in Tanzania, it has also been associated with higher fraud rates. The quality of service provided by ATMs was not related to the privacy and security of its users or providers. Therefore, they suggested that banks should enhance their security measures to prevent web scammers from infiltrating their customers' accounts.

Abibual, Atinkugn, and Getnet, (2023), examined the effects of Automated Teller Machine Service Quality on customer satisfaction in Commercial Banks in Ethiopia. Cross-sectional data were collected through a Questionnaire from a sample of three hundred and forty-six

users of the Automated Teller Machine selected from Semera-logia City, Asyatia, and Awash Town respectively. To identify the dimensions of Automated Teller Machine service quality and their relationship with customer satisfaction, confirmatory factor analysis and structural equation modeling through SPSS and AMOS 23.0 data analysis software were used. The findings indicate that convenience, reliability, ease of use, fulfillment, and security/privacy of Automated Teller Machine service quality dimensions are positively and significantly associated with customer satisfaction. The result of this study can help banks' management improve the quality of their ATM services to increase customer satisfaction.

Point-of-service (POS) Banking Services and Performance of Banks

Arseculeratne (2019) studied the impact of digital banking on banks' profitability: study on the Sri Lankan banking industry. The research analyzed quarterly data from year 2010 to 2018. Data were obtained from the Payment and Settlement Department of the Central Bank of Sri Lanka and the Central Bank website. Bank performance was identified by the return on assets (ROA) before tax. From the number of digital banking aspects, the variables used in this study were the number of Internet banking transactions, the number of point-of-sale (POS) machine transactions, and the number of mobile banking transactions (MOBT). Time effectiveness and the cost-effectiveness of digital banking were discussed in the study. Augmented Dickey-Fuller Test was used to check the stationarity of the variables. Since the stationarity test revealed that all four variables become stationary at the 1st difference, cointegration of the variables was drawn through the Johansen Cointegration Test. The trace test indicated four cointegration equations and the Max-Eigen Statistic test indicated only one cointegration equation at the 5% level. Hence Vector Error Correction Model (VECM) was fitted to determine the long-run equilibrium. The model showed that there exists a very stable long-run association. The Impulse Response Function was employed to illustrate the importance of each digital banking aspect to banking sector profitability when a shock is imposed on the system. The study observed that POS transactions affect profitability positively, while Internet banking and mobile banking showed a negative impact on profitability. In the short run, internet banking and POS transactions showed an association with profitability.

Sujud and Hashem (2020) studied bank innovations in the fields of mobile banking, debit, and credit cards, automated machines (ATM), internet banking, point of sale terminals (PST), and electronic funds transfer (EFT). They purposely looked into those innovations about their influence on the profitability and return on assets (ROA) of Lebanese commercial banks. Data was collected through a research questionnaire, and statistical analysis was done using the Package of Social Sciences Software (SPSS). The results revealed a significant positive impact of bank innovations on profitability and return on assets of Lebanese commercial banks and significance tests also showed that the impact was statistically significant. Based on the results of the study, the study concluded that bank innovations affect the profitability and return on assets (ROA) of commercial banks in Lebanon positively.

Ozaji, et al, (2021) examined the effect of point of sale (POS) transactions on the security of banking transactions in the Nigerian economy. The study used an ex-post facto research design and secondary data sources, analyzing aggregate quarterly data from all deposit money

banks operating in Nigeria from 2012 to 2019. Error Correction Model estimation and Autoregressive Distributed Lag model estimation were used to test hypotheses after conducting the Augmented Dickey-Fuller Unit Root Test and co-integration test. The results showed that the introduction of cashless banking through POS transactions in Nigeria had not significantly affected the number of fraud and forgery cases in deposit money banks but had significantly impacted the amount involved in attempted or reported fraud and forgery. The study also found that cashless banking via POS transactions had not significantly affected actual losses due to fraud and forgery.

On the other hand, Okonkwo and Ekwueme (2022) conducted a study to determine the impact of the POS payment method on the financial performance of deposit money banks in Nigeria. Adopting an ex post facto research design, the authors sampled 13 deposit money banks out of the 22 banks operating in the country and collected data from the CBN Statistical bulletin and annual reports of the sampled banks for the period from 2009 to 2019. Regression analysis was performed using E-Views 9.0 statistical software. The results showed that the POS payment method hurt the return on assets of quoted deposit money banks in Nigeria, though this effect was not statistically significant at the 5% level of significance. The authors suggest that banks should host seminars and workshops to educate clients and merchants about the advantages of the POS payment method.

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Research Design

This research adopted the *ex-post-facto* research design. The researcher opted for this design approach because we intend to use secondary data to achieve our specific objectives. The *ex-post-facto* design is a quasi-experimental study that examines how an independent variable affects a dependent variable. A quasi-experimental study simply means that the variables studied are not randomly assigned and that the observations have been made and kept for reference and inferential purposes. For this study, the design involved gathering time series data that have cross-sectional properties i.e. data from five different banks and subjecting the time series data to econometric analysis of unit root, cointegration, and panel model estimation.

Methods of Data Analysis

The study adopted the Least Squares (LS) method of analysis within the panel fixed and random effects regression model. The fixed effect model is considered more appropriate than the random effect model if the evidence from the results of the Hausman (1978) Specification

test gives us a significant result (Chen, 2009). To deal with heterogeneity, panel data is an effective and appropriate way because; the data is more informative, there is higher variability, co-linearity is low or no co-linearity is present, and the degree of freedom and the efficiency is higher respectively (Chen, 2009).

Table 3: Test of Hypotheses

Hypotheses I	Variables	t-stat.	p-value	Decision
H ₀₁ : There is no significant effect of mobile pay banking services on the performance of the banks in Nigeria.	MOB	0.44207	0.6600 > 0.05	The <i>p-value</i> is not significant therefore, we accept the null hypothesis and conclude that there is no significant effect of mobile banking on banks' performance.
Hypotheses II	Variables	t-stat.	p-value	Decision
H ₀₂ : Transactions made through automated teller machine have no significant effect on the performance of banks in Nigeria.	ATM	2.5680	0.0127 < 0.05	The <i>p-value</i> is significant therefore; we reject the null hypothesis and conclude that ATM transactions significantly affect banks' performance.
Hypotheses III	Variables	t-stat.	p-value	Decision
H ₀₃ : There is no significant relationship between point-of-service (POS) banking services and performance of banks in Nigeria.	POS	-0.4423	0.6598 > 0.05	The <i>p-value</i> is not significant therefore, we accept the null hypothesis and conclude that there is no significant relationship between POS and banks' performance.
Hypotheses IV	Variables	t-stat.	p-value	Decision
H ₀₄ : Web pay banking services have no significant effect on the performance of banks in Nigeria.	WEB	-0.3285	0.7437 > 0.05	The <i>p-value</i> is not significant therefore, we accept the null hypothesis and conclude that web pay banking services have no significant effect on banks' performance.
Hypotheses IV	Variables	t-stat.	p-value	Decision
H ₀₅ : There is no significant effect of e-banking penetration rate on banks' performance in Nigeria.	EBP	4.1993	0.0001 < 0.05	The <i>p-value</i> is significant therefore; we reject the null hypothesis and conclude that there is significant effect of e-banking penetration rate on banks' performance.

Source: Extracted from E-views Output

The test of hypotheses shows that for hypothesis one, we accept the null hypothesis since the probability value of 0.6600 is greater than the 0.05 critical value, and as such, we conclude that there is no significant effect of mobile pay banking services on the performance of banks in Nigeria.

For hypothesis two, the probability value is significant at the 5% level since it is less than 0.05 critical value; therefore, we rejected the null hypothesis and concluded that transactions made through automated teller machines have a significant effect on the performance of banks in Nigeria.

In hypothesis three, we accepted the null hypothesis since the probability value of 0.6598 is greater than 0.05 critical value. We concluded that there is a significant relationship between point-of-service (POS) banking services and the performance of banks in Nigeria.

The fourth hypothesis led to the conclusion that web-pay banking services have no significant effect on the performance of banks in Nigeria since the probability value of 0.7437 is greater than 0.05 critical value.

Hypothesis five has a probability value of 0.0001, which is less than 0.05 critical value. Therefore, we concluded that there is a significant effect of e-banking penetration rate on banks' performance in Nigeria.

Discussion of Findings

In this sub-section, the results from the analysis made in Chapter 4 are collated to give a comprehensive view of the significance and direction of the study. The aim of this is to draw conclusions and make comparisons with previous literature that will establish the area's best suited for policy implementation to enhance the performance of banks vis-à-vis electronic banking transactions. The results from Section 4.2.1 provide evidence from the panel unit root test which suggests the suitability of the data for the study. In a bid to adequately capture the effect of electronic banking services on the performance of banks in Nigeria, we adopted data on mobile, ATM, POS, and web/internet banking transactions as measures of electronic banking services. The measure of banks' performance was their return on assets. The data was cross-sectional cutting across five major banks in Nigeria namely First Bank, UBA, GTB, Access Bank, and Zenith Bank. Due to their cross-sectional nature, we adopted the panel LLC unit root test. The test revealed that the statistical properties of the data do not vary over time and as such they were suitable for estimating a panel time series analysis. In line with the position of Greene (2002), the first difference in stationarity of time series data proves the adequacy of the data and prepares the data for long-run tests.

We also did the cross-sectional dependency test in Table 4.2b and observed that the data were independent of each other and took due cognizance of bank peculiarities. Sadorsky (2014) upheld the view that cross-sectional dependency may not be appropriate for panel data and that there should be independence of the cross-sections to give a robust result. The Kao panel co-integration test which follows the Engle and Granger model proved that the long-run relationship between electronic banking and the performance of banks can endure and propel banks for sustained growth in the long run.

The most appropriate estimation technique for the relationship between electronic banking and banks' performance, according to the Hausman specification test, would be to assume heterogeneous slope coefficients for the e-banking variables. The heterogeneous slope coefficients, also known as the Random Effect (RE) model were thus estimated. The estimation revealed a positive relationship between mobile banking transactions and the ROA of banks. Also, the positive relationship was not significant given that the probability of 0.6600 was not significant. In other words, mobile banking transaction of banks increases their

performance but not significantly. The positive aspect of the findings agrees with the study of Okon and Amaegberi (2019), Daniyan-Bagudu, et al (2019), Jimoh (2020), Eze and Egoro (2020), etc. These studies revealed that a positive and significant relationship exists between mobile banking and the Profitability of banks. While this present study found the positive relationship not to be significant, it means that the incorporation of updated data is the point of difference between this study and the previous works. This may be the reason for the difference in the significance of the variable (mobile banking).

Again, we found a positive and significant relationship between ATM banking transactions and the ROA of banks in Nigeria. It implies that an increase in transactions made via ATM increases the performance of banks in terms of their profitability in a significant manner. The study by Jegede (2018) indicated that the deployment of ATM terminals has average improved the performance of Nigerian banks because of the alarming rate of ATM fraud. Our present finding does not align with this due to the introduction of the 'fraud' factor in the study of Jegede (2018). However, other studies such as Mwal (2018), Ali and Kalu (2019), Itah and Ene (2021), and Ulaya, Kiwia, and Rahul (2023) held that the implementation of ATM terminals had generally been beneficial for banks and has enhanced their financial and non-financial performance metrics.

Further findings revealed that point-of-sale (POS) transactions and web/internet banking transactions have negative effects on the performance of banks in Nigeria. The negative effect was, however, not significant in the long run. The implication of this is that the introduction of POS and web/internet banking have not helped to enhance the profitability of banks but the decreasing effect they exert on banks' ROA was not significant. Studies such as Premeela (2018), Olannye, et al (2017), Williams, et al(2021), etc. found that POS enhances the non-financial performance metrics such as customer retention, perception and experience of the customers, and bank density. Other studies outside of Nigeria like Arseculeratne (2019), and Sujud and Hashem (2020), observed that POS transactions affect profitability positively. Interestingly, the negative effect of POS on banks' performance in Nigeria agrees with some studies carried out in Nigeria such as Okonkwo and Ekwueme (2022), and Ozoji, et al, (2021). Other studies (Mohammed et al, 2022; Adu and Williams, 2023; Opuala-Charles and Dibia, 2023, Ashiru, et al 2023; etc.) observed a positive relationship between POS and the performance of banks in Nigeria. Nworie and Okafor (2023) observed exorbitant transaction charges, lack of adequate infrastructure required to run POS, irregular network connectivity, security challenges of network communications, etc, are among the factors that make POS transactions exert a negative effect on banks' performance. Similar challenges also face mobile/internet banking transaction channels.

The relationship between the electronic banking penetration rate and the ROA of banks in Nigeria was positive and significant. This implies that the electronic banking penetration rate has increased the return on assets of banks significantly over the years. This aligns with Bousrih (2023) who opined that the performance of banks was significantly impacted by e-banking subscribers wherein customers were willing to use e-banking transactions in place of traditional bank accounts. Also, Meihami, et al (2023) found that the correlation between

electronic banking and bank performance was high. Electronic banking has also enhanced financial inclusion according to Sui and Mon (2018).

The study found a strong significant joint relationship between electronic banking services and the performance (ROA) of banks in Nigeria. Overall, electronic banking services jointly accounted for as high as 77.98 percent of the changes in banks' return on assets in Nigeria. The estimates showed that there will not be a significant improvement in banks' ROA without electronic banking services thus underlining the vital role played by this innovation in enhancing banks' performance.

Summary of Findings

The findings made in this study are very interesting and relevant considering the focus of banks in enhancing their electronic banking channels for improved profitability and performance. The data were analyzed using the Panel Random Effect model and the result obtained gave rise to the following findings as summarized:

1. Mobile pay banking services increase the return on assets of banks but not significantly.
2. Transactions made through automated teller machines have a significant and positive effect on the performance (ROA) of banks in Nigeria.
3. Point-of-sale banking services exert a negative effect on the return on assets of banks in Nigeria, but the negative effect was not significant.
4. Web-pay banking services have no significant effect on the performance of banks in Nigeria and it also decreases the ROA of banks.
5. There is a significant positive effect of e-banking penetration rate on banks' performance in Nigeria. The electronic banking variables jointly affected the return on assets of the bank's studies and jointly accounted for approximately 77.98 percent of the changes in banks' ROA for the period reviewed.

Conclusion

The importance of electronic banking in enhancing the performance of banks in Nigeria cannot be over-emphasized. Deposit Money Banks have no doubt benefitted from innovative banking services such as mobile, internet, and even point-of-sale banking services. This study did a thorough analysis of electronic banking channels and their effect on the ROA of banks in Nigeria and made some useful findings. The conclusion from the findings is that electronic banking services have increasingly enhanced the performance (ROA) of banks in Nigeria most especially mobile and ATM banking channels. The ratio of electronic banking transactions to GDP (e-banking penetration rate) increasingly enhanced the ROA of banks significantly which suggests that banks have been making significant progress in their profitability ratio given increased access to electronic banking channels. However, point-of-service (POS) and web/internet banking channels showed a decreasing effect on banks' performance which suggests that banks may not be making enough profits from these channels due to some reasons not clear in this study. To ensure increased profitability of banks, it is advocated that banks should adopt one or a combination of the recommendations made below.

Recommendations

The study recommends that:

1. Point-of-service banking channels should be more secure, efficient, and strictly monitored to return adequate profits to banks. The proliferation of POS services in Nigeria and the resultant negative effect it exerts on banks' profitability gives strong insinuations that banks may not be strictly monitoring this e-banking channel.
2. In addition to the suggestion made above, the regulatory authority should enhance the banking infrastructure that will make the web-banking experience seamless and more secure. Banks should be making adequate profit and improved performance through web banking, and this can be made possible through improved e-banking infrastructure.
3. Mobile banking channels should be made to have a significant effect on banks' performance metrics by way of increasing access to mobile services, especially in rural areas.
4. The Central Bank of Nigeria should intensify efforts to enhance e-banking penetration through the introduction of more e-banking channels, improvement in the existing channels, and engaging in customer sensitization, especially in rural areas. Improvement in banks' performance is a function of enhanced electronic banking channels and all banks should ensure they actively engage in customer sensitization and enlightenment.

Contributions to Knowledge

This study has contributed to the body of economic and financial literature by way of expanding the variable scope of study of this nature. The introduction of electronic banking penetration rate i.e. ratio of e-banking transactions to GDP expressed in percentage is a novelty, to the best of the researcher's knowledge, and is meant to advance the knowledge frontiers in academic learning. Thus, further research in this area can expand from where this current research ends. There is an obvious addition to knowledge in making the banks in Nigeria aware of the various ways that they can explore to further improve electronic banking channels. Thus, this study can be utilized by industry players and even regulatory authorities as a practical tool for policymaking for improved banking services in Nigeria. Additionally, this study has provided updated knowledge on the nexus between electronic banking and banking sub-sector performance in Nigeria. Thus, this new knowledge can serve as a foundation for further research.

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