



BANKING INNOVATIONS AND BANK PERFORMANCE IN NIGERIA

ABSTRACT

The study examined the impact of banking innovations and banks performance in Nigeria from 2005-2023 using data from Central Bank of Nigeria statistical bulletin 2023. The study adopted Autoregressive Distributed Lag model (ARDL) based on the diagnosis unit root test. Findings from the study revealed that Automated teller machine and point of sale have insignificant impact on performance of banks in both the short and long run periods, while mobile banking and point of sale (POS) machine transactions have significant impacts on performance of banks in both the short and long run periods. Findings also revealed bank size and inflation are significant factors contributing to banks performance in Nigeria in the long run compared to other private investments which were insignificant in the long run. Further findings revealed that private investments and inflation rate were statistically significant in the short-run period while bank size was insignificant in the short-run period and this calls for intensification of effort to increase the assets of banks in Nigeria. The study recommends that the major determinants of banks performance among the variables captured in the study are mobile banking, point of sale, mobile banking and bank size. The insignificant impact of Automated Teller Machines (ATMs) on banks' performance calls for provision of adequate Automated Teller Machines (ATMs) by commercial banks in the country, especially in the rural areas where banks penetration is low so as to increase the speed of banking transactions thus leading to increase in banking performance.

Keywords: *Bank, Banking Innovations, Transaction, Performance, Automated Teller Machines, Point of Sale*

1.0 Introduction

Globalization, technological innovations and advanced development in different economies' financial systems, especially in this 21st century have really changed the dynamics of financial transactions globally. The explosive growth in ICTs has removed the narrowed digital divide and turned the business sphere into an electronic world (e-world). Nigerian banks are no exception as banks in Nigeria, especially after the consolidation and recapitalization exercises, have strengthened and streamlined their facilities, tailored their services as well as automated their operations in line with this trend. This has given rise to the adoption of aggressive marketing approaches by the banks.

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In the heat of competition, banks are now adding to the stock of e-banking in order to maintain a competitive edge over their competitors (Adewuyi, 2011). The trend of e-banking has progressed from inception in 1986 when the Societe Generale Bank of Nigeria (SGBN) streamlined real-time banking into five subdivisions in Lagos State (Okoro, 2014) and launched its 1st Automated Teller Machine (ATM) in November of the year 1990.

Progressively, the early 2000s was characterized with the prevalent adoption of e-banking by many other Nigerian banks. Today, Nigeria banking industry has been characterized by the deployment of ATMs, internet, phones and Point of Sale (POS) as electronic payment tools (Okoro, 2014). In view of the cashless policy and technological development in Nigeria, the Nigerian banking system is appreciating the use of electronic forms of banking. ATMs, mobile phones, credit cards and debit cards, internet, cyber cash also become delivery avenues for normal banking services and products (NBS,2012). Currently, all commercial banks in Nigeria have their individual networks and platforms for payment like credit and debit cards as well as operation of ATM switch networks. Nigeria has adopted several reforms to reposition her financial sector and improve banking performance. These policies ranges from financial liberalization, capitalization and consolidation, electronic banking, cashless policy, non –interest banking, and most recently Bank Verification Number to stabilize the financial system and eliminate fraud. These Financial sector reforms and development have played a vital role in promoting bank performance in Nigeria through electronic banking. Electronic banking development is characterized by changes in the way of innovation.

By Electronic banking innovations, we mean the emergence of new financial instruments, products, services and new forms of organization structure in more sophisticated and complete financial markets. These instruments and products are electronically and technologically based, which include Points of Sale, Automated Teller Machines, Electronic Cards, both credit and debit card which offered fastservice delivery to customers at any point in time.

Taiwo & Agwu (2017), Ajayi & Olalekan (2016), and Amu & Nathaniel (2016) have given supportive credence to the adaptation of electronic banking by banks that it is an innovative phase that has the enablement to improve the overall performance of banks and balance their scorecard in terms of operational efficiency. Electronic banking innovations has indeed revolutionized the Nigerian banking system such that it has tackled most of the challenges associated with the old, manual way of conducting banking transactions given the rate of increase in electronic banking innovations in Nigeria banking system, it is surprising that empirical evidence using adequate data are not sufficient on quantitative evidence on bank performance-Electronic banking innovations nexus despite the increasing rate of usage. Thus, this research work seeks to proffer empirical evidence on e-banking innovations on old and new generation banks performance in Nigeria that are e-banking innovations compliant within the research period. Despite the performance of banks in Nigerian banking sector, it is surprising that the recent publications from National Bureau of statistics, (2014) and CBN (2014) based on the CAMELS (Capital Adequacy, Asset Quality, Management, Earnings, Liquidity and risk sensitivity) system for banks' health concluded that only four banks were categorized as strong, nine banks satisfactory, seven banks were shaking and four banks were on the brink of distress.

The capital adequacy ratio (CAR) of commercial banks decreased from 17.8 percent in 2013 to 15.92 percent in 2014 and however surpassed the capital base sufficiency edge of 10 percent. The savings money industry aggregate credits and advances remained at 12.63 trillion in 2014, demonstrating an increment of 25.73 percent more than 10.04 trillion in 2014. NBS (2014) further showed that the business volume of non-profitable advances in banks expanded by 10.26 percent from 321.66 billion in 2013 to 354.84 billion in 2014, whereas non-profitable advances to aggregate credits proportion increased from 3.20 percent in 2013 to 2.81 percent in 2014. Statistics have further shown that Nigeria still have low payment penetration rate in spite of revolution in modern payment systems. Compared to some of its contemporaries, statistics have shown that Nigeria has a low formal payment penetration rate of 21.6 per cent as against 46 per cent obtained in both Kenya and South Africa, while accessibility to savings accounts in Nigeria stood at an average of 461 savings accounts for every 1000 population when compared to 2,063 savings accounts for every 1000 population in Malaysia (Mbutor, 2013).

Evidence has also shown that the number of automated teller machines (ATMs) in Nigeria deployed at the end of 2011 was 9,640, representing an average of 11 number of automated teller machines for every 100,000 adults population of Nigeria, compared with an average of 59 number of automated teller machines (ATMs) for every 100,000 adult population in South Africa, 42 automated teller machines (ATMs) for every 100,000 adult population in Argentina, 13 automated teller machines (ATMs) for every 100,000 adult population in Indonesia, 56 automated teller machines (ATMs) for every 100,000 adult population in Malaysia, and 120 automated teller machines (ATMs) for every 100,000-adult population in Brazil.

In Nigeria, Internet banking and ATM are the leading channels for perpetuating e-fraud. Statistics show that the volume of e-fraud reported was 822 in 2013 and in 2014, the volume rose rapidly to 1,461 (CBN, 2015). Attempted fraud value reported was N19,148,787,069 billion in 2013 and in 2014, attempted fraud value reported was N7,750,152,718 billion. In the same way, the actual loss value due to e-fraud was N485,194,350 million in 2013 and N6,215,987,323 billion in 2014 (CBN, 2015). There are also cases of hidden charges by banks to their customers.

Furthermore, empirical studies on the impact of e-banking innovations on the performance of banks have been inconclusive. Studies such as Uzikwambara, Kihooto and Mudakemwa (2022), Demaki, Eromafuru and Festus (2021), Nishani and Nishadi (2022), as well as Raymond, Enenezer, Kehinde and Lateef (2022) showed a significant impact of e-banking innovations on the performance of banks while a study such as Haniel and Zouhour (2018) indicated an insignificant impact of e-banking innovations on the performance of banks. Given the issues raised above, this is contrary to the aim of financial sector reforms and development. Since it is obvious that the conventional indicator in measuring the contribution of financial sector performance is measured by the quantum of mobilized funds and the volume of credit given, especially to the private sector. Hence, despite the rapid development in banking innovations, the scenarios have cast doubt as to whether banking innovations have impacted positively and significantly on banks performance in Nigeria. The following research questions were raised to guide the study. What is the impact of ATM transactions on the performance of banks in Nigeria? What is the impact of mobile banking transactions on the performance of banks in Nigeria? What is the impact of point of sales transactions on the performance of banks in Nigeria? The main objective of the study is to estimate the impact of banking

innovations on the performance of banks in Nigeria. The specific objectives are, to estimate the impact of Automated Teller Machines (ATMs) transactions on the performance of banks in Nigeria, to ascertain the impact of mobile banking transactions on the performance of banks in Nigeria to determine the impact of point of sale (POS) machine transactions on the performance of banks in Nigeria. The following research hypotheses were stated in a null form to guide the study. H₀₁: Automated Teller Machines (ATMs) transactions do not impact significantly on the performance of banks in Nigeria. H₀₂: Mobile banking transactions does not impact significantly on the performance of banks in Nigeria. H₀₃: Point Of Sales (POS) machine transactions does not impact significantly on the performance of banks in Nigeria.

Following the introduction of the paper, the rest of the paper is structured to include the literature review cum theoretical framework, research methodology, discussing of findings, conclusion and policy recommendation.

2.0 Literature Review

Electronic banking: Sadr (2013) defined electronic banking as rapid spread of services that enables customers to access and use computer to access account specific information and also conduct transactions from any location. Now, compared to the traditional system of banking, banks provide fast information delivery from customer to customer making it obvious that variations exist between services offered by electronic enable banks and non-banks (Singhal & Padhmanabhanm, 2008). It is noted that in 2005, Electronic banking innovation was considered fastest growing commercial activity on the internet, and this has improved banking transactions for global competitiveness in the 21st century (Udeze, Okafor, Nwafor & Abarikwu, 2013). Precisely, electronic banking innovations have eased and fastened banking transactions, lowered cost of banks operations, improved profits maximization (Saleh & Alipour, 2010). Electronic banking has also made it possible for banks to go beyond the borders of their locality, transform strategic behavior within the banking industry and make cashless policy a reality (Chavan 2013).

Electronic banking is a form of information technology in the banking system that is changing the form and structure of service delivery in the banking system thus turning out to be a significant element in the development of banking sector (Auta, 2010). This has made it possible for money used in form of ATM cards, credit cards, debit cards, smart cards, Electronic cheques which are important avenues for exchange systems leading to a paradigm shift in marketing practices as well as high performing banking system (Christopher, Mike, Visit & Amy, (2006). For instance, ATM and Deposit machines allow bank customers to carry out banking operations and transactions beyond banking hours while internet and mobile banking platforms can help users check account balances and make transaction payments and withdrawals without visiting the banking halls (Menson, 2010; Ngango, Mbabazize & Shukla, 2015) which is gradually and systematically leading to cashless societies. With the emergence of mobile telecommunication and internet services in the country, the financial system has bubbled with a flurry of products and services including the use of e-cards through POS and ATMs as well as other e-banking facilities.

Automated Teller Machine (ATM): These are computerized telecommunications devices that provide clients of a financial institution with access to financial transactions in a public place. According to Idowu (2005), the introduction of automated teller machines serves as the beginning and the foundation of electronic banking in Nigeria. He further stressed that ATMs is basically a cash dispenser as well as a unique 24/7 service facility, that is, the machine unattended (mounted either outside or inside the banking hall) which allows the client to transact limited business without referring to any bank staff except in case of problem and difficulty round the clock (Adewuyi, 2011). An ATM allows a customer to withdraw cash from

his bank account by entering a Personal Identification Number (PIN) after the insertion of a card into the machine and having the amount of the withdrawal immediately debited to the account of the customer (Adewuyi, 2011).

Credit Cards: These are plastic cards encoded with electromagnetic identification. The card is incorporated with a circuit on which value is loaded. Customers can use the card to carry out transactions on the ATMs deployed by the issuing banks at strategic locations as well as point of sale terminals with designated signs of the producer of such cards. These cards debit cash from the owner of the account's holder in respect to transactions for goods and services. It comes in various forms such as Visa, MasterCard or Verve (Adewuyi, 2011).

Point of Sale (POS) terminal: This is a computerized replacement for a cash register. The POS system can include the ability to record and track customer orders, process credit and debit cards, connect to other systems in a network, and manage inventory. A positive relationship is expected on the coefficient of POS since POS terminal is attributed to reducing the cost of banks transactions, access to credit and reduces the cost of setting bank infrastructure such as bank branches as a case may be.

Bank Size (BSZ): This represents the economies and diseconomies of scale associated with firm size. According to the financial intermediation theory, banks can only make profit as a result of the degree of economies of scale. For example, larger banks that are engaged in oligopoly can enjoy low transaction cost and retained high profit (Flamini, McDonald & Schumacher, 2009). Also, these banks would have access to larger levels of loans, product diversification and market assessment compared to smaller banks (Guru, Staunton & Balashanmugam, 2000).

Bank Verification Number (BVN): Bank verification Number according to the researcher refers to the universal number that shows individual customers details on daily transactions.

Online Banking:(ONB) Online banking in the context of this study refers to the access banks gives to customers to manage their individual account based on their personal ID number (PIN) to buy products by means of Personal computers or phone via internet.

Nigeria Electronic Fund Transfer (NEFT): The easiest way of transferring fund via ATMs or Personal Computer. Any exchange of trust started by electronic means from an electronic terminal, phone, PC and ATM.

This theory was developed by Davis in 1986. The model was formally developed from the research conducted by Davis (1989) on technological issues. The result of this research led to the development of the Technology Acceptance Model (TAM). This model seeks to establish the relationship between individuals' behavioural and the use of Information and Communication Technology (ICT). It is argued that the behaviour of an individual influences his attitude towards adopting new technology. However, attitude and perceived usefulness are both determined by ease of use. (Pedersen et al 2002) maintains that adopting the TAM model is based on knowing end-users' requirements with respect to how easy and friendly the technology is presented.

According to technology acceptance model, one's actual use of a technology system is influenced directly or indirectly by the user's behavioural intentions, attitude, perceived usefulness of the system, and perceived ease of the system. TAM also proposes that external factors affect intention and actual use through mediated effects on perceived usefulness and perceived ease of use (Davis, 1989). The argument against technology acceptance model is that it focuses more on the technology/technical aspect of technology but silent on other factors affecting technological acceptance such as socialization behaviour of individuals. The technological acceptance model has an application in the banking industry in that it explains the acceptability of technological innovation in the financial system. Because of this, the theory is considered suitable for this study in explaining the acceptance of electronic and cashless payments options such as Automated Teller

Machines (ATMs), Point of Sales (POS), Internet banking and mobile banking.

Uzikwambara, Kihooto and Mudakemwa (2022) investigate the effect of bank innovation on finance performance of commercial bank in Rwanda, especially in bank of Kigali Ltd main Branch. The study aims to finding out whether the influence of bank innovations was effective and whether they really had influence on the financial performance of commercial bank in Rwanda. The design of this study was a quantitative descriptive in nature. A sample size of 50 respondents were selected purposively to take part into this study and Descriptive statistics such as frequency, percentages, mean and standard deviation were obtained to describe the characteristics of the variables whereas multiple regressions model was used to establish the relationships between the variables. Data were analysed using statistical package for social sciences (SPSS) version 20. The findings revealed that there is very significant and strong effect of bank innovation on the financial performance of commercial bank in Rwanda. The study also revealed that there is very strong correlation between bank innovation and finance performance of commercial bank.

Demaki, Eromafuru and Festus (2021) examined the relationship between electronic banking and the performance of deposit money banks (DMBs) in Nigeria using ex-post facto research design. Quarterly time-series data of mobile banking, automated teller machine, internet banking, point of sales and return on assets were obtained from the Central Bank of Nigeria Statistical bulletin during the period 2009-2019. Data obtained were analysed using both descriptive (mean, standard deviation, and Pearson correlation) and inferential (unit roots, co-integration, error correction model, Jacque-Bera test and variance inflation factor test) statistical techniques. Findings revealed that mobile banking; automated teller machine and point of sales were statistically significant, suggesting that they are critical technological factors enhancing financial performance of banks. On the other hand, internet banking found to be statistically insignificant with financial performance of banks, implying that they are weak factor enhancing financial performance of banks in Nigeria. In effect, the study concludes that electronic banking has effect on deposit money banks financial performance in Nigeria.

Nishani and Nishadi (2022) investigate the impact of financial innovation on bank performance in the context of commercial banks in Sri Lanka. Automated Teller Machines (ATM), mobile banking, internet banking, and debit cards are used as proxies to measure financial innovation while bank performance is measured by ROA and ROE. Pooled OLS regressions are estimated using data for a balanced panel of 11 commercial banks over 10 years from 2010 to 2019. All the proxies for financial innovation have significant effects on bank performance. However, the effects are not uniform across the performance measures. The results show that the financial innovations proxies of ATMs, internet banking, and debit cards have a significantly positive impact on ROA, while mobile banking has a negative impact. Internet banking has a significant positive impact on ROE, while ATMs and mobile banking are negatively related to ROE. These findings underscore the important role played by financial innovation in bank performance. Haniel and Zouhour (2018) examine the impact of technological innovation factors on the performance of Lebanese banks during an eight-year period (from 2010 to 2017). The research employed return on assets (ROA) and return on equity (ROE) as proxies to measure performance level. The technological innovation factors include internet banking, mobile banking, automated teller machines and investment in computer software. The technological innovation investment in automated teller machines (ATMs) and internet banking has positive impact on the performance of Lebanese banks. The results also reveal non-significant impact of mobile banking and investments in computer software on the performance of Lebanese banks.

Kato, Otuya, Owunza and Nato (2014) examined the impact of mobile banking on the performance of commercial banks in Kenya. The sampled commercial banks for this study included standard chartered Bank, Barclays Bank, National Bank of Kenya, Kenya Commercial Bank, Co-operative Bank, Diamond Trust Bank, Equity Bank, Equatorial Commercial Bank and Family Bank in Kakamega Town. Date for this study was obtaining using a well-constructed questionnaire. The inferential statistics such as Pearson's

Product Moment Correlation coefficient and multiple regression analysis were employed in examining the relationship among the variables in the specified equation. The results of the correlation analysis revealed that there was a positive association between commercial banks performance and interbank transfer, cash withdrawal, balance, inquiry, bill payment and information inquiry. The result of this study was consistent with the result obtained by Kosmidou and Zoponidis (2008) which found that there was a significant relationship between banking sector methodologies and productivity and efficiency in the banking sector.

Aduda and Kingoo (2012) investigated the relationship between electronic banking and the performance of commercial banks in the financial system of Kenya employing data for the period stretching from 2006 to 2010. The authors employed the Pearson's product moment correlation coefficient and the regression analysis in examining the relationship between electronic bank and the performance of commercial banks. Analysis of the descriptive statistics revealed that total assets of the banks rose from 52410.07 million Kshs in 2006 to 121662.28 million Kshs in 2010, averaging 82902.57 million Kshs. In the same period, profit after rose from 957.53 million Kshs in 2006 to 2390.15 million Kshs in 2010. Analysis of the descriptive statistic also showed that there was an increase in the number of ATMs there installed from 85 in 2006 to 115 in 2010. Number of debit cards issued by banks to customers rose from 1154829 in 2006 to 1553999 in 2010. Lastly, return on assets rose from 0.018 in 2006 to 0.020 in 2010. The results of the correlation analysis revealed that there was positive and high degree of relationship ($r = 0.631$) between expenditure on ICT investment (e – banking) and returns on assets in Kenya. The result also showed that there was positive and high degree of correlation ($r = 0.715$) between number of debit cards issued to customers and returns on assets of the commercial banks in Kenya. However, the correlation analysis showed that number of automated teller machines (ATMs) was negatively related to returns on assets during the evaluation period. Similar to the correlation results, the result of the regression analysis showed that there was a positive and significant relationship between investments in e-banking and return on assets. This means that a 1 percent increase in e-banking investment led to an increase in return on assets by 4.209 percent, *ceteris paribus*. In the same vein, the results showed that number of debit cards issued to customers has positive and significant relationship with return on assets. In real terms, a 1 percent increase in the number of debit cards issued to customers led to an increase in return on assets by 1.435 percent, other things, remaining the same. Contrary to a priori expectation number of automated teller machines (ATMs) installed by banks has negative relationship with return on assets. This means that a 1 percent increase in the number of ATMs installed by banks brought about a decrease in bank performance by 5.313 percent, *ceteris paribus*. In conclusion, the study revealed that electronic banking has brought closer to the people banking services and hence improves financial inclusion.

Okiro (2013) assessed the influence of mobile and internet banking on the performance of financial in Kenya. A total number of 61 financial institutions were selected for this study from which 30 of them were finally sampled using the stratified sampling techniques. Data for this study were collected using a well- designed questionnaire. The collected data were analysed employing both qualitative and quantitative statistical tools. The qualitative method used was content analysis which quantitative tools such as tables, pie-charts, and graphs were used in analysing the quantitative data. The result of this study showed that there has been increased turnout of customers since the introduction of mobile banking in Kenya. On the performance of the financial institutions, the study revealed that the application of mobile banking has significant impact on the performance of banking institutions in Kenya. In absolute term, about 80% of the respondents held that the application of mobile banking has impacted significantly on the performance of banking performance in Kenya.

In their study, Al-Smadi and Al-wabel (2011) examined the influence of e-banking, on the performance of banks in Jordan, employing analysed data spanning from 2000 to 2010. The study used returns on equity as the dependent variable while the independent variable was electronic banking, a dummy variables which took value 1 if banks have adopted e-banking and value 0 if they have not adopted e-banking. Other control variables captured alongside e-banking included the size of banks, the level of capital, credit risk, liquidity level, expenses management, inflation rate and economic growth. The results of regression analysis showed that the adoption of electronic banking has significant negative effect on the performance of banks in Jordan. The implication of this result was that the adoption of e-banking has not led to improvement of banking performance in Jordan during the evaluation period. In the similar manner, the results showed that expenses management liquidity level and inflation rate have negative relationship with bank performance in Jordanian economy. On the other hand, the results showed that bank size capital level of banks credit risk and growth rate of gross domestic product have positive impact on bank performance in Jordan. The study therefore recommended that the Jordanian banks should intensify efforts at promoting to use of e-banking channels customers of banks. The paper also recommended that marketing strategies aimed at encouraging customers to used e-banking resources should be implemented.

Salehi (2010) investigated the impact of electronic banking on the overall economic performance in emerging economics, with particular reference to Iranian economy. This study employed data obtained from two sources, from secondary serves were gotten from internet textbooks and published journals. Second set of data were obtained from a well - constructed questionnaire by the author. A total number of 600 respondents were sampled using simple random sampling technique. The study employed chi-square statistics in testing the relevant hypotheses. The results of the study found that adoption of e-banking has benefited bank customers greatly as it has helped overcome the hindrance associated with the traditional banking system. Also, the application of the electronic banking has led to an increase in the volume of transactions in the Iranian banks. Further analysis of the results showed that the introduction of electronic banking has led to an increase in the number of people using ATMs or conducting their business transactions, finally, the results of this study showed that, the adoption of e-banking such as creation of new markets, reduction in operational costs and administrative cost, etc.

Raymond, Ebenezer, Kehinde, and Lateef, (2022). examines the impact of electronic banking on bank performance in Nigeria. The secondary data collected from the central bank of Nigeria Statistical bulletin from 2009-2017 were subjected to Johansen Co-integration and Vector Error Correction Method (VECM). The findings revealed through the Johansen Co-integration results depict a long-run relationship between the variables. The Fully Modified Least Square depicts that Mobilepay and Webpay have a significant negative effect on NIM (Net Interest margin) while POS (Point of Sale) has a significant positive effect on NIM (Net Interest Margin). In another study, Agboola (2006) examined the impact of e-banking and electronic payment system in Nigeria. The results of this study revealed that there has been significant migration of people away from holding cash to automated transactions, there by leading to the reduction in the volume of cash in circulation. The results of the study also found that the application of e-payment system in Nigeria banks relationship, resulted to high level of customers, loyalty and ensured that banks maintained a larger market share. The study further identified factory inhibiting the smooth application of e-banking in Nigeria to include poor tele-communication services, dwindling power supply situations, high operational costs, prevalence of fraudulent activities etc.

Auta (2010) investigated the impact of electronic banking in the Nigeria economy, using data that were collected for the period of three months beginning from the second week of January 2010 to the fourth week of March 2010. Data for this study were collected from 25 banks operating in Nigeria during the period using a well – structured questionnaire administered in Abuja and Lagos. A total of 750 respondents were sampled utilizing simple random sampling techniques. Data collected were evaluated and analyzed using the statistical package for social sciences (SPSS) within the framework of principal component

factor analysis. The results based on the principal component factor analysis showed that various factors enhancing the adoption of electronic banking in Nigeria included factor accessibility and fund transfer. On the impact of e-banking, the study revealed that the adoption of e-banking has promoted convenience and flexibility in banking operations. The study also identified other transaction benefits related to e-banking adoption, lower transaction costs, speedy transfers, easy means of checking transaction statements and details, provision of fund transfer facilities and better ways to manage cash.

Itah and Ene (2012) undertook a study on impact of cashless banking on banks' profitability in Nigeria. The study used proxies for cashless banking such as Automated teller machine (ATM), Point of sale (POS), and web-based transaction (WBT) to examine its impact on the aggregate return on equity (ROE) of deposit money banks in Nigeria, through an ordinary least square (OLS) multiple regression method of analysis. The result showed that ATM and POS are positively related to ROE, while WBT related negatively to ROE. This is as a result of high rates of bank charges on online deposits and as a result, most customers do not patronize the product. Non-usage of the WBT for online deposits had created a negative impact on profitability of Nigerian banks. In another study, Oyewole, El-Mauda, Abba and Arikpo (2013) carried out a study on e-banking and bank performance in Nigeria. Panel data comprised annual audited financial statements of eight banks that have adopted e-banking and retained their brand name banking between 2000 and 2010 as well as macroeconomic control variables were employed to investigate the impact of e-banking on return on asset (ROA), return on equity (ROE) and net interest margin (NIM). Result from pooled OLS estimations indicate that e-banking begins to contribute positively to bank performance in terms of ROA and NIM with a time lag of two years while a negative impact was observed in the first year of adoption. It was recommended that investment decision on electronic banking should be rational so as to justify cost and revenue implications on bank performance.

This study will deviate from the existing studies in terms of theoretical framework and methodology of the study. It is noted that the previous studies failed to anchor their studies on relevant theoretical framework and methodology to show how bank innovations impact on banks performance in Nigeria. To the best of our knowledge and with thorough research, we have not come across any study that investigated the impact of e-banking innovations on bank performance in Nigeria using the auto regressive distributed lag model (ARDL). The purpose of this study is to fill the gap by estimating the impact of banking innovations on Bank performance in Nigeria quantitatively using the auto regressive distributed lag model (ARDL).

3.0 Methodology

Research Design

This study adopts the ex post facto research design. The decision was premised on the efficiency with which Ex-post Facto research procedure utilizes both theoretical and empirical theses simultaneously to examine the efficacy of banking innovations on bank performance in Nigeria using time series data from 2005-2021.

Model specification

This study is anchored on the diffusion of innovation theory. This theory attempts to explain how, why and the rate at which new ideas and technology spread across societies. According to the diffusion of innovation theory, the process of adopting a new idea, product, behaviour or technology (that is, innovation) does not necessarily occur simultaneously in a social system but that it is a process whereby some people are more readily disposed to adopting the innovation than others. Therefore, the empirical model for this study can be expressed functionally as:

$$ROA = f(ATM, POS, MOB, SIZE, PRINV, INFL) \quad 4.1$$

Where:

ROA = return on assets, measuring performance of deposit money banks.

ATM = value of Automated Teller Machines transactions

POS = value of Point of Sales transactions
 MOB = mobile banking transactions
 SIZE = bank size, represented by total assets of the banks
 PRINV = private investment in Nigeria.
 INFL = inflation rate, measuring macroeconomic instability

Econometrically, equation 4.1 can be expressed in its linear form as:

$$ROA_{it} = \beta_0 + \beta_1 ATM_{it} + \beta_2 POS_{it} + \beta_3 MOB_{it} + \beta_4 SIZE_{it} + \beta_5 PRINV_{it} + \beta_6 INFL_{it} + \mu \tag{4.2}$$

Where:

β_0 to β_6 are the parameters to be estimated
 μ = Stochastic error term
 t = time dimension of the variables

This study employs the Ordinary Least square Method of estimation (OLS) in modeling the equations for the study.

Estimation technique and Justification of the model

The study adopts the autoregressive distributed lag (ARDL) model developed by pesaran, shin and smith (2001). ARDL models are linear time series models in which both the dependent and independent variables are related not only contemporaneously but across historical (lagged) values as well. In particular, if y_t is the dependent variable and X_1, \dots, X_k are k explanatory variables, a general variables, a general ARDL (p, q_1, \dots, q_k) model is given by:

$$y_t = \alpha_0 + \alpha_{it} + \sum_{i=1}^p u_{iyt} - i + \sum_{j=1}^k \sum_{j=0}^{qj} B_j, Ijx j, t - ij + \mu_t \dots \dots \dots \tag{4.3}$$

Where ϵ_t are the usual innovations, α_0 is constant term, and α_i, u_i and B_j are respectively the coefficients associated with a linear trend, lags of y_t and lags of the k regressors x_j, t for $j = 1, \dots, k$.

Therefore equation (1) can be transformed into unrestricted ARDL model so as to carry out bound tests of cointegration and represented as:

$$ROA_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta ROA_{t-1} + \sum_{i=1}^p \alpha_2 \Delta ATM_{t-1} + \sum_{i=1}^p \alpha_3 \Delta POS_{t-1} + \sum_{i=1}^p \alpha_4 \Delta MOB_{t-1} + \sum_{i=1}^p \alpha_5 \Delta BSIZE_{t-1} + \sum_{i=1}^p \alpha_6 \Delta PRINV_{t-1} + \sum_{i=1}^p \alpha_7 \Delta INF_{t-1} + \epsilon_t \dots \dots \dots \tag{4.4}$$

The ARDL model is employed because from the unit root test conducted using both the ADF and Philip Perron Procedures, some variables are integrated of order one (1(1)) while some are integrated of order zero (1(0)). In other words, they have mixed order of integration. In particular, pesaran, shin and smith (2001) argue that ARDL models are especially advantageous in their ability to handle cointegration with inherent

robustness to misspecification of integration orders of relevant variables.

Data sources and Software

The study utilized banking variables and macroeconomic data sourced from various Central Bank of Nigeria, Statistical bulletins, National Bureau of Statistics Publications to examine efficiently and factually the efficacy of banking innovations on bank performance in Nigeria. The data obtained was analysed using E-view 9.

4.0 Results analysis and discussion of findings

Lag length selection

The study used VAR lag order choice to select (choose) the lag lengths. The outcome of the analysis reported in the table below suggests the maximum lag length of one at five per cent level of significance for the equation.

Table 4.1: Lag order for the equation

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-766.2310	NA	7.18e+34	97.27887	97.85831	97.30854
1	-679.7695	86.46150*	2.35e+32*	90.97118*	93.28895*	91.08987*

*indicates lag order selection by the criterion

LR: sequential modified LR test statistic (each test at 5% level), FPR: Final predication error, AIC: Akaike Information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Source: Researcher’s computation, 2024

Unit root result

Table 4.2: Phillips - Perron unit root results

Variables	PP Level (PP 1 st Diff)	PP Critical value1 st diff) at 5%	Decision
ROA	0.392177 (-4.037475)	-3.052169 (-3.065585)	1(1)
INF	-1.617172 (-5.631844)	-3.052169 (-3.065585)	1(1)
BSIZE	-0.311183 (-5.495510)	-3.052169 (-3.065585)	1(1)
PRINV	-6.312880	-3.052169	1(0)
ATM	-4.195943	-3.065585	1(0)
MOB	-5.086690	-3.052169	1(0)
POS	-4.887599	-3.052169	1(0)

Source: Researcher’s computation, 2024

According to the estimated result on table 4.2, the Phillip Perron result indicate that ROA, INF and BSIZE were stationary at first difference while PRINV, ATM, MOB and POS were stationary at level using 5 per cent level of

significance. Since the variables are of mixed order of integration, the autoregressive distributed lag model (ARDL) was adopted to estimate the time series in the study.

5.2.3 ARDL Bound test result

Table 4.3: ARDL Bound test result

Test Statistic	Value	K
F-statistic	17.46438	6
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
1%	3.15	4.43

Source: Researcher's computation, 2024

From the ARDL bound test result presented in table 4.3, there is a long run relationship amongst the variables considered in the equation. This is due to the fact that the value of F-statistic (17.46438) is greater than the critical value at 5 per cent level in both the upper (3.61) and lower (2.45) bounds. Therefore, the null hypothesis of no long - run relationship is discarded and the study proceeds with the estimation of the long run and the short run equations as presented below.

Table 4.4: ARDL long-run result

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ATM)	-1.440245	0.705696	-2.040886	0.1933
LOG(BSIZE)	7.205565	1.867886	3.857605	0.0611
INF	0.320041	0.033271	9.619168	0.0106
LOG(MOB)	3.991725	1.092418	3.654027	0.0775
LOG(POS)	-3.158322	0.837889	-3.769379	0.0637
LOG(PRINV)	-0.254031	0.343340	-0.739881	0.5364
C	-69.442702	39.858922	-1.742212	0.2236

Source: Researcher's computation, 2024

The long run result is represented on table 4.4. From the result, LOG of ATM, LOG of POS and LOG of PRINV all have negative relationships with bank performance. The result show that an increase of 1 per cent in LOG of ATM, LOG of POS and LOG of PRINV leads to decreases of 1.44, 3.2 and 0.25 per cents in

bank performance in Nigeria under the evaluation period. However, from the long run result, LOG of BSIZE, INF, and LOG of MOB all have positive relationships with bank performance in the long run. This imply that an increase of 1 per cent in LOG of BSIZE, INF, and LOG of MOB leads increase of 7.2, 0.3 and 4.0 per cents in bank performance respectively in the long run in Nigeria under the evaluation period. The result further reveals that LOG of MOB, LOG of BSIZE, INF and LOG of POS are statistically significant at both 5 and 10 per cent levels since their p-values of 0.0775, 0.0611, 0.0106 and 0.0637 are all less than 0.05 and 0.10 respectively. On the contrary, LOG of ATM, and LOG of PRINV are not statistically significant at 5 and 10 per cents levels since their p-values of 0.1933 and 0.5364 are all greater than 0.05 and 0.10 respectively.

Table 4.5: ARDL short-run Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(BSIZE)	-29.316506	13.720598	-2.136678	0.1661
D(INF)	0.631400	0.108423	5.823468	0.0282
DLOG(MOB)	1.856642	0.495313	3.748422	0.0625
DLOG(POS)	-1.515458	0.317886	-4.767302	0.0413
DLOG(PRINV)	-1.136928	0.350768	-3.241249	0.0834
ECM (-1)	-0.307123	0.066777	-4.599718	0.0304

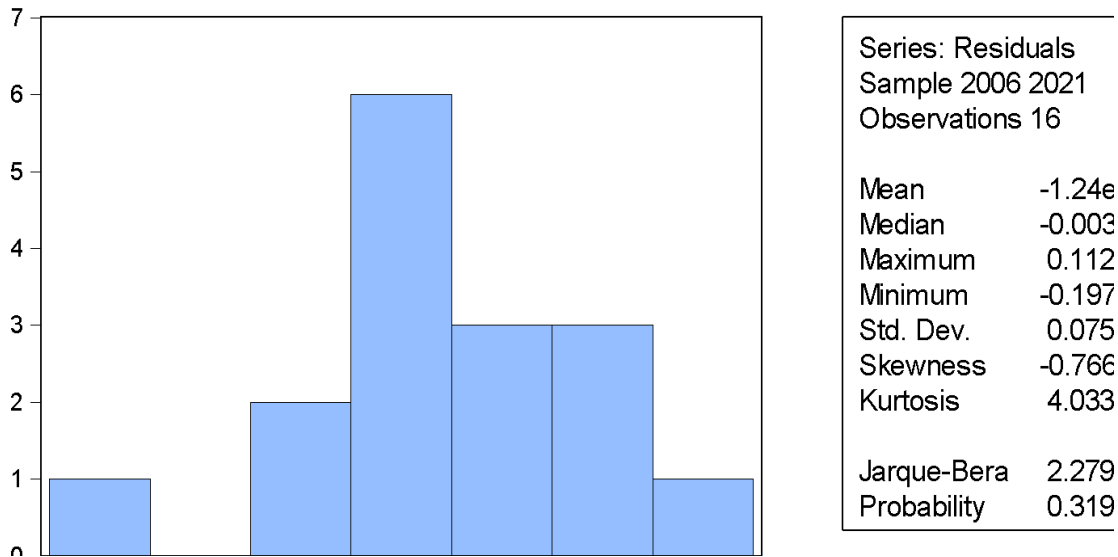
Source: *Researcher's computation, 2024*

Discussion of findings

According to the short-run results in table 4.5, LOG of ATM, INF and LOG of MOB all have positive relationships with bank performance in the short run. The result show that an increase of 1 percent in LOG of ATM, INF and LOG of MOB leads to 0.5, 0.6 and 1.86 per cents increases in bank performance in Nigeria under the evaluation period. On the other hand, LOG of BSIZE, LOG of POS and LOG of PRINV all have negative relationships with bank performance in the short run since a 1 per cent increase in LOG of BSIZE, LOG of POS and LOG of PRINV result to a 19.3, 1.52 and 1.14 per cents decrease in bank performance under the evaluation period.

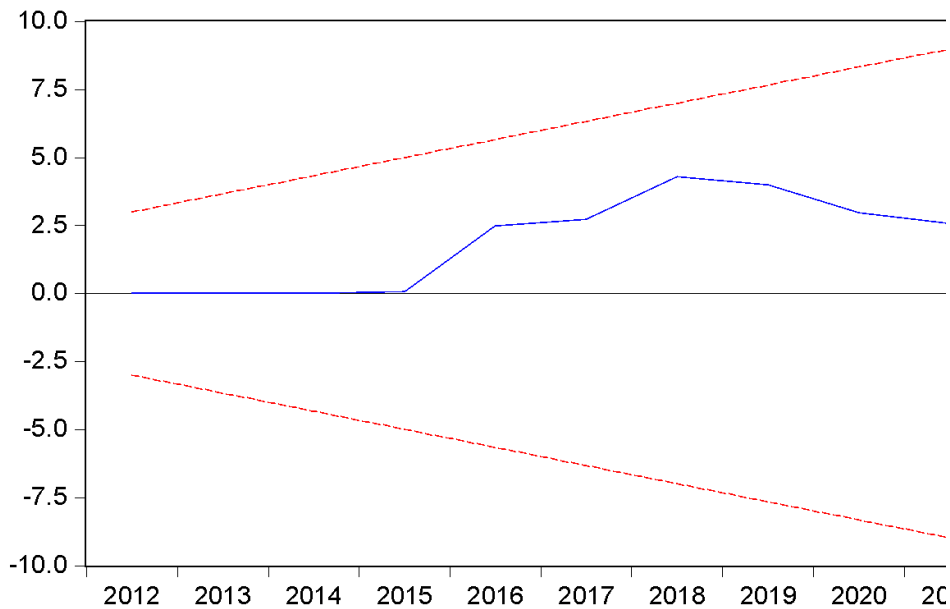
Further finding from the ARDL short-run result indicated that LOG of ATM and LOG of BSIZE are not statistically significant at both 5 and 10 per cent levels since their p-values are all greater than 0.5 and 0.10 respectively. However, INF, LOG of MOB, LOG of POS as well as LOG of PRINV are all statistically significant at 5 and 10 per cent levels. Also from the result, the error correction mechanism coefficient of -0.307123 satisfies all three criteria for its acceptability, i.e. it must be negative, fractional and statistically significant. Therefore, it reaffirms the existence of long run relationships amongst the variables in the model. It shows that the speed of adjustment is slow since only 30.71 per cent of the short run disequilibrium is corrected each period in the long run.

Fig. 4.1: Normality test



The result in figure 4.1 shows that the model is normally distributed based on the Jarque-Bera test with a high probability value of 0.258206 which is higher than the 0.10.

Fig. 4.2: Stability test



The CUSUM result as shown in figure 4.2 above indicates that the blue line falls within the upper and the lower bound, therefore, we conclude that our model is stable over the period of analysis.

5.0 Conclusion and Policy Recommendations

The use of e-banking is widespread in banks and most financial institutions nowadays. The internet has really changed the dimensions of competition in the retail banking sector. New distribution channels used in rendering services to customers are being achieved. Bankers and banks customers have adopted e-banking because of acceptance of the new innovative information technology of which customers in Nigeria are not exempted. The notion that e-banking would significantly impact on return on assets (profitability) has been established in this study which means that e-banking is an integral part of the participating bank's business strategies to make profits.

The finding from this study presented significant progress toward understanding the nature of e-banking and its perceived impact on commercial banks in Nigeria. Findings revealed that in sum, Automated teller machine and point of sale has a statistically insignificant impact on performance of banks in both the short and long run periods, while mobile banking and point of sale (POS) machine transactions all have statistically significant impacts on performance of banks in both the short and longrun periods. Also bank size and inflation were statistically significant factors contributing to banks performance in Nigeria in the long run compared to other private investments which was insignificant in the long run. Further findings showed that private investments and inflation rates were statistically significant in the short-run period while bank size was insignificant in the short-run period. Therefore, based on the major findings, the study concluded that the major determinants of banks performance among the variables captured in the study are mobile banking, point of sale, mobile banking and bank size. The insignificant impact of Automated Teller Machines (ATMs) on banks' performance calls for provision of adequate Automated Teller Machines (ATMs) by commercial banks in the country, especially in the rural areas where banks penetration is low so as to increase the speed of banking transactions thus leading to increase in banking performance.

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