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DIGITAL INNOVATION AND PROFIT AFTER TAX OF DEPOSIT MONEY BANKS IN NIGERIA

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Abstract

The study examined the effect of digital innovation on the profit after tax of deposit money banks (DMBs) in Nigeria. The study adopted a quasi-experimental research design in evaluating the effect of digital innovation variables: computer expenditure (COMEXP) and software expenditure (SOFEXP) on profit after tax (PAT) of DMBs in Nigeria. Secondary data were obtained from online published financial statements of five DMBs in Nigeria for the period of 2010 to 2024. The study employed multiple regression analytical technique to analyze the collected data. The findings revealed that both computer expenditure (COMEXP) and software expenditure (SOFEXP) had a significant positive effect on the PAT of DMBs in Nigeria. The study recommended that DMBs should strategically deploy digital innovations to reduce customer challenges, such as long queues and transaction delays, to enhance customer satisfaction.

Keywords: Digital Innovation, Computer Expenditure, Software Expenditure, Deposit Money Banks, Nigeria.

Introduction

Digital innovation has transformed global banking operations, leading to competitiveness in service delivery. Digital innovation in the financial landscape has overhauled the business strategies, operations, and delivery models of financial institutions and deposit money banks. This has led to the strategic development and adoption of digital innovations, which include mobile banking platforms, internet banking, and electronic payments. The rapidly evolving technological environment ensures that companies are actively adopting digital technologies to drive changes in production methods, management practices, and service delivery (Vial, 2019). The dramatic change in the business landscape over the last several years has seen organizations implementing new technology not only to increase productivity and profitability but also to

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ensure that there is no negative impact on the economic, social, and environmental aspects of their operation. Though Andriole (2018) stated that digital innovation strategies are being embraced to improve operational efficiency, competitive advantage and securing business continuity by providing a decline in communication, coordination, and transaction costs, creating new market opportunities and enhancing organizational efficiency for sustainability of businesses, Ritter and Pedersen (2020) opined that strong emphasis is laid on digital innovation that provides unrestricted access about business performance, customers, and opportunities. Presently, digital innovation is an inescapable decision, irrespective of a firm's size or type (Ahmadin 2022).

In Nigeria, the Central Bank has played a major oversight role in the digital innovation of the banking sector, ensuring that strategic changes in payment delivery are safe, reliable, foster inclusion, and ensure economic growth and development (CBN, 2022). Furthermore, the Payment System Vision 2025, launched in 2022 by CBN, lists objectives to modernize the payment landscape through contactless payments, open banking, and advanced data analytics in the banking sector (CBN, 2022). Such policies affirm institutional commitment to digital innovation in the banking sector. Digital innovation, being a continuous process, driven by the ever-changing digital space (DCSL, 2024), geared towards speed of delivery and business continuity, has to impact the economy, society, and the environment as part of the firm's competitive edge. The banks, therefore, are expected to utilize technological innovations in ways that are economically viable, socially responsible, and environmentally considerate. The integration of new digital technology in the banking sector must align with long-term organizational objectives for it to be effective.

To remain technologically relevant, deposit money banks in Nigeria must expend significant resources on digital assets. These include costs on computer hardware, which covers servers, data centers, automated teller machines, and point-of-sale machines. Software costs include expenses on mobile banking platforms, software procurement and licenses, upgrading of bank applications, cybersecurity software, and data analytics. These assets provide seamless digital services that meet customer demands. This study examines the relationship between digital innovation and the profit after tax of deposit money banks in Nigeria, focusing on how expenditure on digital innovation impacts the profitability of these banks.

Statement of the Problem

The growing reliance of deposit money banks in Nigeria on digital innovation has prompted significant expenditure on digital tools. Banks continue to invest in technological tools that promote efficiency for their brands. In a country with many financial institutions, banks invest in technology to not only attract customers but also maintain customer loyalty. While digital

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innovation may reduce transaction costs, increase financial inclusion, and drive profitability, the question remains whether the banks can sustainably expend significant resources on digital innovation.

Recently, deposit money banks have been under pressure due to the surge in the number of financial technology service providers in the country. The entrance of these financial solution companies has prompted deposit money banks to invest in digital tools and assets that will ensure they also provide or even exceed competitive banking services to customers. The annual financial reports of deposit money banks reveal significant investments in digital products. This leaves the question of the value of these significant expenditures on business profitability unanswered in the Nigerian banking sector.

Studies on digital innovation and bank profitability in Nigeria are few, with a consensus yet to be reached. Extant studies include those with a focus on financial technology and performance of deposit money banks in Nigeria (Bilkisu & Kabiru, 2015; Ashiru, Balogun & Paseda, 2023; Alagbe & Yinus, 2025); artificial intelligence and performance of deposit money banks in Nigeria (Adejola, Noguera, & Lambe, 2024); electronic banking and performance of deposit money banks in Nigeria (Ebah, Kwanti & Lawal, 2023). The study fills the gap in digital innovation and the sustainability of deposit money banks (DMBs) in Nigeria by investigating the effect of computer expenditure and software expenditure on profit after tax of DMBs in Nigeria from 2010 to 2024.

Objectives of the Study

The primary objective of this study is to determine the impact of digital innovation on the profit after tax of deposit money banks in Nigeria. Specifically, the objectives of the study are as follows:

1. Determine the effect of computer expenditure (COMEXP) on profit after tax of deposit money banks in Nigeria.

2. Ascertain the effect of software expenditure (SOFEXP) on profit after tax (PAT) of deposit money banks in Nigeria.

Research Questions

1. How does computer expenditure (COMEXP) affect profit after tax (PAT) of deposit money banks in Nigeria?

2. What is the effect of software expenditure (SOFEXP) on profit after tax of deposit money banks in Nigeria?

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Statement of Hypotheses

H01: There is no significant effect of computer expenditure on profit after tax of deposit money banks in Nigeria.

H02: Software expenditure does not have significant effect on profit after tax of deposit money banks in Nigeria.

Review of Related Literature

Conceptual Framework

Digital Innovation

Digital innovation refers to the adoption and creation of digital technologies to create new products, services, processes, and models that improve business competitiveness and profitability. Digital innovation involves the use of digital technologies to create products or services, operational processes, or business models (Nambisan, Lyytinen, Majchrzak & Song, 2017). Digital innovation brings about infrastructural change, integrates all aspects of operations, improves operational efficiency, alters production and organizational methods, reduces costs, and introduces new business models (Zhai, Yang, & Chan, 2022). In the banking sector, digital innovation tools include core bank software, bank applications, mobile banking applications, automated teller machines (ATMs), point-of-sale (POS) machines, blockchain, and artificial intelligence, which enhance profitability (Adetunji, Ogunyomi, & Olufemi, 2022). According to Kritoffersen, Blomsma, Mikalef, and Li (2020), digitalization is an important driving factor for the circular economy, which must be led by digital transformation.

Digital transformational activities refer to the integration of digital technologies in business operations. Digital transformation is complex and costly, with a focus on features and functions (Oladejo, Akintunde, Azeez, & Oyeleke, 2024). Chang and Sofri (2024) assert that digital transformation plays a crucial role in improving enterprise sustainability performance. By integrating digital technologies into their operations, companies can achieve better economic, environmental, and social outcomes, thereby promoting company growth and supporting sustainable development goals. The integration of digital technologies in business operations requires a comprehensive approach that considers technological advancements, strategic planning, organizational capabilities, and cultural shifts within the enterprise, which, according to Cheng and Sofri (2024), spurs companies to explore new combinations of existing resources or develop new products/services, thereby enhancing performance.

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According to Zhai, Yang, & Chan (2022), digital innovation drives a positive triple bottom-line impact. The utilization of information and communication technology (ICT) in business operations may not yield better business performance unless it is properly managed through an entrepreneurial orientation (Yunis, Tarhini, & Kassar, 2022). According to Pan, Han, Song, and Wang (2020) digital innovation improves research and development (R&D), which in turn improves the profitability of firms.

Computer Hardware and Software

Computer hardware refers to the physical components of a computer system, including all the parts with a circuit board (Okeke, 2024). The major components of computer hardware for banks include servers, data storage, ATMs, laptop and desktop systems, and networking equipment. These components support transaction processing, data management, electronic banking platforms, and automation (Ombati et al. 2010; Ashiru, Balogun & Paseda, 2023). Software refers to the core banking system that provides seamless service delivery. Included in banking software are the mobile apps, licensing fees, enterprise resource planning (ERP) systems, and cybersecurity systems that integrate multiple channels (Ong & Teh, 2022; Oluwaseun & Adewale, 2021; Laudon & Laudon, 2022).

Investment in banking software and hardware has become imperative for advancements in digital financial services. Banks in Nigeria continue to invest in and upgrade their digital facilities to remain competitive not only in the domestic market but also globally. According to Oladejo, Akintunde, and Olayele (2024), factors that determine fintech expenditure in deposit money banks are 75% related to acquiring infrastructure, and 65% to software expenditure. Since improving operational efficiency remains vital to the success of deposit money banks in Nigeria, investments in technology tools are vital to sustaining a competitive advantage. According to Laudon and Laudon (2022), investments in computer hardware and software are typically substantial, yielding greater returns in terms of efficiency and financial performance. According to Bails-Jones (2024), sustainability software is quickly becoming a necessity for all businesses as they strive to meet regulatory requirements. However, expenses on the acquisition of software reduce short-term profit but impact on long-term profit based on its effective usage, as there is no doubt that high energy consumption and wastefulness can both harm the planet. Adopting sustainable software that reduces waste not only helps the environment but also delivers wide-ranging benefits for businesses. Making the effort to enhance operational sustainability leads firms to become more adaptable, cost-efficient, and behave more ethically, which in turn improves profitability (Bails-Jones, 2024).

Profit After Tax

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Profit After Tax (PAT) refers to the residual earnings after deduction of operating expenses, interest and tax from total income of deposit money banks. In the banking sector, PAT measures the long-term viability of deposit money banks and the ability to innovate and expand operations (Ene & Adigwe, 2019). According to Scholtens (2017), sustainable banking performance goes beyond short-term earnings to emphasize stability, efficiency, and the ability to continue operations without eroding financial or social capital. In this regard, profit after tax (PAT) is recognized as critical to the sustainability of deposit money banks, as it reflects the bank's financial state and investment capacity (Akinyomi & Okpala, 2013).

Empirical Framework

Bilkisu and Kabiru (2015) studied the impact of investment in information technology on the financial performance of Nigerian banks from 2006 to 2010. Investment in IT (Hardware, software, and automated teller machines), total earnings (TE), and total cost (TC) were proxies for the independent variable, while the dependent variable was proxied with return on assets, return on equity, net profit margin, and earnings per share. Analysis with panel regression was carried out on data from ten sampled banks. Findings revealed that investment in IT is significant at ROA, ROE, and EPS, but not for NPM. However, the relationship with the four proxies was negative, which is not the expected result.

Okeke (2024) examined the effect of information and communication technology on the financial performance of listed consumer goods firms in Nigeria. Return on capital employed served as a proxy for financial performance, while funding for ICT hardware and funding for ICT software were proxies for information and communication technology. Analysis was carried out with E-views version 12. Findings revealed that financing for ICT hardware and funding for ICT software have a negative and insignificant effect on the financial performance of consumer goods firms in Nigeria.

Adejola, Noguera, and Lambe (2024) assessed the effect of artificial intelligence investments proxied by computer software expenses and computer software book value on the performance of deposit money banks in Nigeria from 2012 to 2022. The study revealed that software expenses have an insignificant effect on ROE, while software book value has a significant but negative impact on ROE.

In their study, Ebah, Kwanti & Lawal (2023) examined the effect of electronic banking systems on the financial performance of commercial banks in Nigeria. Using the co-integration error correction approach, the study analysed quarterly time series data of mobile banking, real-time gross settlement (RGS), NIBBS instant payment (NIP), and return on assets (ROA) of eight sampled banks from 2010Q1 to 2024Q1. Findings revealed that electronic banking systems have a significant effect on the performance of banks in Nigeria.

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Ilo, Aina & Isiaq (2024) examined the effect of technology adoptions on financial performance of deposit money banks in Nigeria from 2012 to 2019. The Fully Modified Ordinary Least Squares (FMOLS) regression method was utilized to analyze emerging technology such as web payment, mobile money operators, automated teller machines, and point of sale terminals. Findings revealed that emerging technology adoption has a positive long-run relationship with the financial performance of DMBs in Nigeria.

Luo and Liu (2024) in their study utilized data from Chinese listed manufacturing enterprises from 2011 to 2020 to examine the relationship between digital technology application, service-oriented transformation, and the sustainable development of enterprises. The study revealed that the application of digital technology significantly improves the environmental and economic performance of enterprises by driving service-oriented transformation and technological innovation, which further enhances their sustainable development.

From the review, few empirical studies have been carried out on the study. The available studies also have conflicting results. The study intends to fill the gap.

Theoretical Framework

The transaction cost theory, first introduced by British economist Ronald Coase (1937), posits that firms prioritize minimizing transaction costs as a fundamental strategy to ensure efficiency and long-term survival. Information asymmetry between the firm and the external environment attracts higher transaction costs, as additional resources are required to obtain and manage relevant information. Such inefficiencies may negatively affect production and other business activities. Within the deposit money banks, such information gaps may slow down transactions, increase operational risk, and affect business performance. This underscores the need to reduce information gaps in the banking sector. There are many transaction costs in the market. These costs make it impossible to conduct transactions, hinder business activities, and negatively impact business performance. According to Zhu (2024), the adoption of digital innovation plays a major role in minimizing traditional transaction costs. Digital innovation has access to abundant data resources, which help reduce information asymmetry and lower the costs associated with searching, processing information, negotiation, and supervision between supply and demand parties. In the Nigerian banking system, the introduction of digital innovations such as mobile and internet banking platforms has enhanced customer verification and transaction transparency. These digital innovations have greatly reduced transaction costs while sustaining the performance and growth of deposit money banks in Nigeria. The reduction of transaction

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costs improves enterprise productivity and also helps enterprises achieve economies of scale and scope.

The Resource Dependence Theory (RDT)

The Resource Dependence Theory (RDT) proposed by Pfeffer and Salancik (1978) posits that firms adapt their strategies in response to pressures and uncertainties in the external environment to secure critical resources necessary for survival and growth. The implication is that firm sustainability is dependent on changes in relation to the external environment. Firms cannot live in isolation of the external environment. According to Khan, Piprani & Yu, (2022), firms cannot achieve self-awareness and self-sufficiency in isolation. Firms depend on the interaction and exchange of material, information, energy, and other critical resources controlled by external factors. The implication is that there must be dependency on the external environment.

Khan, Zia-ul-haq, and Yu (2021) argue that digital technology can improve the efficiency of resource utilization within firms, thereby reducing excessive dependence on external environment factors. Digital innovation enables firms to optimize internal processes, manage limited resources, access real-time information, monitor the entire production process, strengthen key controls, and also manage the impact of their behavior on the environment. The Resource Dependence Theory emphasizes the need for firms to strategically adopt digital innovation to mitigate environmental uncertainties that impact their business. For sustainable performance, technological tools such as artificial intelligence and mobile banking platforms reduce reliance on manual processes. Deposit money banks can manage customer relationships to drive profitability and long-term sustainability.

Methodology

The study employed a quasi-experimental research design to investigate the effect of digital innovation variables, specifically computer expenditure (COMEXP) and software expenditure (SOFEXP), on the profit after tax (PAT) of deposit money banks (DMBs) in Nigeria for the period 2010-2024. Secondary data were obtained from online published annual financial statements of five DMBs in Nigeria. The population consists of all thirteen DMBs listed on the Nigerian Exchange Group (NGX) for the period of the study. Judgmental sampling technique was employed to obtain data from five DMBs listed on the NGX for the period 2010 to 2024. A descriptive research design was adopted to provide information on the relevant variables in the study. Correlation is a statistical procedure used to measure and describe the relationship or association between two variables. Analysis was therefore carried out with the Pearson product-moment correlation to test the strength and direction of the relationships between the independent variables and the dependent variables. The linear regression predicts the value of the

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dependent variables and quantifies the size of the effect of the independent variables on the dependent variable while controlling for covariates.

Model Specification and Variable Measurement

The study employed multiple regression analytical techniques to analyze the relationship between digital innovation, proxied by computer expenditure (COMEXP) and software expenditure (SOFEXP), and profit after tax (PAT) of deposit money banks in Nigeria. To achieve the study's objectives, a functional relationship in the form of a multiple linear regression model, consisting of dependent and independent variables, will be formulated. The econometric model for the research is set as follows:

Profit after Tax = $\beta^0 + \beta^1 COMEXP + \beta^2 SOFEXP + \mu$

Where

β^0 = Constant

β^1 = COMEXP = Computer Expenditure

β^2 =SOFEXP = Software Expenditure

μ = Error term

A priori expectation is that digital innovation affects the profit after tax of deposit money banks in Nigeria.

Decision Rule

The decision rule is that if the probability value (P-value) is less than 0.05, there is a significant relationship between the variables. The study will accept the alternative and reject the null hypothesis. If, on the other hand, the probability value is greater than 0.05, the reverse will be the case and the null hypothesis will be accepted. The implication is that there is no significant relationship between the stated variables in the study.

Data Presentation

The results and analyses will be presented. The descriptive analysis of the variables will be presented first. The next presentation will be the Pearson correlation results. The final presentation will be the regression table, which will constitute the major result of the study.

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Descriptive Statistics

Table 4.1

Table 4.1 below shows the descriptive statistics of the dependent and independent variables for the five deposit money banks in Nigeria from 2010 to 2024, with a total of 75 observations.

Table 4.1: Descriptive Statistics

	PAT	COMEXP	SOFEXP
Mean	38356.81	9235.120	5127.400
Median	11214.00	2276.000	2432.000
Maximum	535680.0	122658.0	48760.00
Minimum	941.0000	149.0000	59.00000
Std. Dev.	87525.65	19785.36	8213.538
Skewness	4.334048	3.734684	3.333395
Kurtosis	22.53049	18.39041	15.45655
Jarque-Bera	1426.800	914.5508	623.7864
Probability	0.000000	0.000000	0.000000
Sum	2876761.	692634.0	384555.0
Sum Sq. Dev.	5.67E+11	2.90E+10	4.99E+09
Observations	75	75	75

Source: E-view 13

Table 4.1 above shows the descriptive statistics for the study. The PAT has mean and standard deviation values of 38356.81 and 87525.65. The PAT has a maximum of 535680 and a minimum of 941. The mean and standard deviation values for COMEXP are 9235.12 and 19785, respectively, while the maximum and minimum values are 122658 and 149. The mean and standard deviation values for SOFEXP are 5127.4 and 8213.53, while the maximum and minimum values are 48760 and 59, respectively.

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Table 4.2: Pearson Correlation

	PAT	COMEXP	SOFEXP
PAT	1	0.7034070540291262	0.439654205931159
COMEXP	0.7034070540291262	1	0.1506087426173256
SOFEXP	0.439654205931159	0.1506087426173256	1

Source: E-view 13

Table 4.2 above shows the correlation between the dependent variables and the independent variables of the study. The Pearson Correlation result reveals a strong positive correlation between expenditure on computers and profit after tax (PAT), with a correlation coefficient of 0.70, indicating that higher investment in computers is strongly associated with increased profitability. Similarly, the correlation between software expenses and PAT at 0.43 indicates a moderate but positive correlation.

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Table 4.3: Dependent Variable: PAT

Method: Least Squares

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Sample: 1 75

Included observations: 75

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6936.170	7950.942	-0.872371	0.3859
COMEXP	2.884202	0.329871	8.743416	0.0000
SOFEXP	3.638692	0.794618	4.579172	0.0000

R-squared	0.608732	Mean dependent var	38356.81
Adjusted R-squared	0.597863	S.D. dependent var	87525.65
S.E. of regression	55503.73	Akaike info criterion	24.72547
Sum squared resid	2.22E+11	Schwarz criterion	24.81817
Log likelihood	-924.2050	Hannan-Quinn criter.	24.76248
F-statistic	56.00852	Durbin-Watson stat	1.253712
Prob(F-statistic)	0.000000		

Source: E-view 13

$PAT = ß^0 + ß^1 (COMEXP) + ß^2 (SOFEXP) + \mu$

$PAT = 2.884202 + 3.638692 + \mu$

Table 4.3 shows the results from the fixed effect panel least square regression. The coefficient of computer expenditure (COMEXP) and software expenses (SOFEXP) show a positive effect on profit after tax (PAT). This implies that any unit change in computer expenditure and software expenses will cause a change in after-tax profit for deposit money banks of 2.884202 and 3.638692, respectively. The adjusted R-squared of 0.597863 indicates that the explanatory variables account for 60% changes in the dependent

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variable, while the error term covers the remaining 40%. The Durbin-Watson statistic, which tends to two rather than one, indicates the goodness of fit of the model.

The test for individual significance using the T-test shows a probability value of 0.0000 for both computer expenditure (COMEXP) and software expenses (SOFEXP), which is less than the 0.05 level of significance. This indicates that both computer expenditure (COMEXP) and software expenses (SOFEXP) have a significant effect on profit after tax (PAT) of deposit money banks in Nigeria.

Discussion of Findings

The study examined the effect of digital innovation on the profit after tax of deposit money banks in Nigeria from 2010 to 2024. Digital innovation was proxied with computer expenditure (COMEXP) and software expenditure (SOFEXP), while the dependent variable was the profit after tax of deposit money banks in Nigeria. The objective of the study was to ascertain whether the investments in digital innovation contribute to profitability of deposit money banks in Nigeria. The correlation test in Table 4.2 showed that expenditure on computers had a strong positive relationship of 70% with PAT, while expenditure on software had a moderate relationship with PAT of DMBs in Nigeria.

Test of hypothesis one revealed that computer expenditure had a positive and significant effect on the profit after tax of deposit money banks in Nigeria. The result of Table 4.3 revealed a probability of 0.000, which is less than the 0.05 level of significance. The result, therefore, led to the rejection of the null hypothesis, which states that there is no significant effect of computer expenditure on PAT of deposit money banks in Nigeria. The finding is in line with Eba, Kwanti, and Lawal (2023), whose findings on electronic banking systems and the financial performance of commercial banks in Nigeria were positive and significant. The result is, however, not in agreement with Okeke (2024), whose study revealed that financing ICT hardware and financing for ICT software have a negative and insignificant effect on the financial performance of consumer goods firms in Nigeria.

Similarly, Table 4.3 revealed a p-value of 0.000 for hypothesis two, which is less than the 0.05 level of significance. The result led to the rejection of the null hypothesis, which states that software expenditure does not have a significant effect on PAT of deposit money banks in Nigeria. The result aligns with the findings of Ilo, Aina, and Isiaq (2024), who revealed a significant relationship between the adoption of emerging technology and the financial performance of deposit money banks in Nigeria. Overall, the findings suggest that both computer expenditure and software are important to the profitability of deposit money banks in Nigeria. By adopting digital innovations, deposit money banks in Nigeria have enhanced service and

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efficiency, thereby improving the after-tax profit of the financial institutions (Zhai, Yang, & Chai, 2022).

Conclusion

The study concludes that expenditure on computer hardware exerts a strong, positive influence on the profit after tax of deposit money banks, whereas expenditure on software demonstrates a positive but moderate effect. These findings suggest that both hardware and software are strong drivers of the profitability of deposit money banks in Nigeria.

Recommendations

The study recommends the following:

- Digital technology should be utilized to reduce customer banking challenges to the barest minimum. These include enhanced security, transaction costs, transaction speed, and accessibility to banking services.
- Prioritize efficient allocation of digital hardware and software.
- The government, through the CBN, must continue to regulate the digital innovations to ensure the sustainability and integrity of digital technologies.

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