

Digital Transformation and Performance of the Deposit Money Banks in Nigeria

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ABSTRACT

The paper examined how the digital transformation has impacted the performance of the deposit money banks in Nigeria between 2009H1 and 2024H2. The point-of-sale transactions (POS), web payment transactions (WPAY), and mobile payment transactions (MPAY) were used as proxies of digital transformation, and the performance was evaluated by the ratio of return on assets (ROA), personnel expenses to gross income (PEGI), and the ratio of return on equity (ROE). The research design adopted was *ex-post facto* research and the secondary time-series data employed was of bi-annual data that was sourced in the Central Bank of Nigeria Statistical Bulletin and Financial Stability Reports. Descriptive statistics, correlation analysis, augmented dickey fuller unit root tests, error correction modelling, ordinary least squares multiple regression, and post estimation Diagnostic tests were used. The findings showed that the statistically significant impact on ROA was jointly with digital transformation (R-squared = 0.3332; F-statistic = 4.6645; p = 0.0091) but POS, WPAY, and MPAY were not significantly significant at the 5 percent level. In the case of PEGI, the impact of digital transformation on personnel-cost efficiency had a significant and statistically significant influence (R-squared = 0.8770; F-statistic = 66.5747; p = 0.0000). In the case of ROE, the combined effect was only very weakly explanatory and statistically insignificant (R-squared = 0.0353; F-statistic = 0.3413; p = 0.7956). The long-run tests based on the residual revealed that the three models had stable long-term relationships and the error-correction terms were not only negative but also statistically significant, which indicated the adjustment of short-run disequilibrium into the long-run equilibrium. It was found that digital transformation is applicable to the performance of deposit money banks in Nigeria, although its impact is greater on the asset profitability and personnel-cost efficiency than on the shareholder return in the period considered. The research suggested more robust digital infrastructure, web-payment optimization, enhanced security architecture, cost-discipline, and integrated channel management.

Keywords: Digital Transformation, Point of Sale Transactions, Web Payments Transactions, Mobile Payments Transactions, Return on Assets, Personnel Expenses to Gross Income Ratio, Return on Equity.

INTRODUCTION

The digital transformation is seen as a form of practicality in explaining how banks can maintain competitiveness and modify their performance due to the digitization of interactions with customers, process of transactions, and service provision which can increase speed, scale, convenience, and generate revenues. This transformation in the context of the banking literature is closely associated with fintech and similar digital innovations that reorganize the way in which financial institutions structure their products, engage customers and execute operations. Lee and Shin (2018) described that fintech made a new financial ecosystem where digital platforms, online channels, and novel payment systems disrupt the traditional banking models and change the scopes of financial intermediation. Abdulquadri, et al. (2021) demonstrated that with emerging technologies, digital transformation is already redefining customer engagement, accessibility, and experience

of services in the financial services. In addition to just purchasing hardware and software, digital transformation in banking can also entail alteration in internal capacity, business agility, workforce expertise and the experiences of stakeholders, which may change institutional results. According to Porffrio, et al. (2024), digital transformation in banking is not a single dimensional concept and thus, its success relies on organizational preparedness as well as the quality of the digital interaction that a banking organization provides to its users. This predisposes digital transformation as a very pertinent issue of bank performance as it can decrease transaction cost, enhance operation efficiency, share non-interest income, expand market penetration and enhance long-run competitive advantage in an ever more technology-driven financial system.

Analytically, the current research application of digital transformation is captured with the use of POS transactions, web payments transactions and the use of mobile payments transactions since these indicators represent the practical application of digital banking channels and not necessarily the existence of digital infrastructure. The digital payment technologies determined in the study by Khando, et al. (2023) include card payments, e-payments, mobile payments, and cryptocurrencies, which is why the choice of POS, web, and mobile payment channels should be taken as a legitimate proxy in every digitalization of banking. POS transactions are merchant-based transactions using terminals, web payments are transactions involving internet connected payments and transfers, whereas mobile payments are app based or phone connected transactions that are rapidly influencing the daily banking behavior. These channels play the central role in the payments reform agenda of the country, Nigeria. According to the Payments System Vision 2025 by the Central Bank of Nigeria, the Nigerian payment landscape is also being repositioned in order to enhance electronic payment adoption, enhancing safety and resilience, innovation, and financial inclusion expansion via digitized channels. It was also observed by David-West, et al. (2020) that to sustain usage and long-term value creation, digital financial services in Nigeria rely on sustainable and scalable technology-driven business models, particularly in mobile based finance. Therefore, the POS transactions, web payments transactions and mobile payments transactions are not just payment indicators, but quantifiable articulations of how much the digital transformation has permeated the operating structure and customer interface of the deposit money banks in Nigeria.

The connection between digital transformation and the efficiency and revenue performance of deposit money banks could be explored with the help of an efficiency-and-revenue mechanism. The volume of transactions completed by banks in a shorter time, reduced average customer service prices, expanded customer access, and enhanced fee-based revenues are among the benefits of fueling the migration of customers to the digital channels with a traditional, branch-based services-oriented banking system. Ashiru et al. (2023) discovered that financial innovation plays a significant impact on the financial performance of the deposit money banks in Nigeria, implying that the innovation in the delivery of the service via branchless and technology-enabled branches is relevant to the outcomes of the institutions. Madugba, et al. (2021) also discovered that electronic banking has a significant influence on the financial performance of the deposit money banks in Nigeria with the POS and web-related channels being the part of the appropriate explanatory structure. Similarly, Mustapha (2018) provided evidence that e-payment technology influences bank performance in emerging economies based on a study of Nigeria. To be more precise, Iheanachor & Ozegbe (2020) have discovered that there are causal relationships between mobile money and banks in Nigeria, meaning that the development of mobile-based transactions can provide the incentives to achieve better banking results. Nonetheless, within the larger body of literature, one can also indicate that the impact of digital transformation might not be necessarily immediately beneficial as the intensity of implementation cost, organizational transition, and the pressure to invest in digital can initially burden reported performance before long-run benefits can set in (Nguyen-Thi-Huong, et al., 2023).

The reasons why this topic has gained importance are evidenced by the recent payment data in Nigeria. Based on the e-payment figures provided by the Central Bank of Nigeria POS transaction volume has increased by about 655.7 million to about 9.85 billion and internet (web) and mobile app transfer volume by about 6.48 billion to about 5.26 billion respectively in the same period. The POS transactions increased in value terms, between 2020 and 2023, POS increased by about 4.73-110.35 trillion, internet (web) increased by about 392.34-1.097 quadrillion, and mobile app increased by about 32.40-219.80 trillion transactions. Such channels were incredibly vast even in the first half of 2024, thus, validating the idea that Nigerian banking becomes mediated via digital platforms. However, the increase in transactions does not necessarily lead to a similar

increase in bank performance since banks continue to experience issues with cybersecurity, the problem of cost of technology, the problems of service reliability, as well as customer adoption, which is not uniform enough, which can bring all benefits of digitalization to a more level. It is this issue that was not resolved and this is what has made the present study a necessity. Although electronic payments are indeed increasing strongly and there is a priority accorded to digital finance in Nigeria on policies and regulations, there is still empirical uncertainty as to whether it is the POS transactions, web payments transactions and mobile payments transactions that have boosted the performance of the deposit money banks in Nigeria substantially. This paper therefore analyses the impact of the digital transformation on the performance of Nigerian deposit money banks.

REVIEW OF RELATED LITERATURE

Conceptual Review

Digital Transformation

The digital transformation means reorganizing business models, customer interfaces, internal processes, and decision systems using the intentional application of digital technologies. The idea in the banking sector extends beyond the transformation of paper-based processes into electronic processes since it incorporates new types of value generation, data utilization, and interaction of services which Lee and Shin (2018) note in the broader fintech ecosystem as a structural change in financial intermediation, as opposed to a tech upgrade. The concept has gained extra tangible existence in the Nigerian financial services environment with the chatbot services, digital platform, and robotized service experiences transforming the customer contact and delivery channels and Abdulquadri, et al. (2021) saw this as an indication that digital transformation is already changing the nature of financial service delivery. The organizational dimension also matters as the effective digital transformation should rely on governance, preparedness, strategic coherence, and process alignment, which Porfirio, et al. (2024) found to play a key role in explaining why once a banking institution becomes faster/yet more transformed in digital transformation. The digital transformation of the deposit money bank, therefore, should be perceived as a cohesive implementation of the technologies enhancing responsiveness, efficiency, flow of information, and reach of services and at the same time shifting the approach of competitiveness, customer retention, and performance outcomes generated by banks.

POS Transactions

POS transactions are electronic payments that are made using point-of-sale terminals that bridge the customer, merchant, card system, and banking infrastructure upon the point of purchase. Practically they are a cash-replacing form of payment channel, which permits real-time authorization, less handling of physical currency and extends the presence of banks outside of their branch premises. In terms of bank research in Nigeria, this channel is considered a significant attribute of electronic banking since Enoruwa, et al. (2019) incorporated POS as one of the key electronic channels that are associated with bank performance and observed that it is a subset of a broader shift of moving toward cashless service delivery. There is also an operational quality of POS that is observed in the studies on growth-oriented banking, as Obi- Nwosu et al. (2021) found that POS transactions have a positive impact on the growth of assets of the deposit banks in Nigeria, and consequently contribute to the growth of the banking operations. In policy and payment-system terms, the use of POS also indicates the extent to which use of digital payment instruments is replacing obsolete paper-based instruments, and Adewale, et al. (2025) indicated that the proliferation of POS correlates with the decline in the use of cheques in Nigeria. POS transactions record a visible, customer facing, and gaining momentum electronic banking activity.

Mobile Payments Transactions

Mobile payments transactions are financial transactions that are started and processed using a mobile phone, mobile banking, USSD functionality, or other phone-enabled digital interfaces. They are significant in their portability, accessibility, and where formal financial services can be extended into the non-bank human environment where bank branches are inconvenient or expensive. The development of mobile financial

services in the Nigerian case has not only been contingent on the presence of technology but upon the viability of the service model, scale and coordination of stakeholders, with David-West, et al. (2020) having argued that mobile financial services cannot be sustained in Nigeria until viable value propositions, scale and coordination actions can occur. On the user side, trust, experience, enabling conditions, and perceived usefulness influences the continued incidence of mobile payments, which Nwosu and Ike-Elechi (2023) categorized as factors critical in understanding why users in southeast Nigeria still conduct their transactions using mobile payment terminals. The banking-related performance of the channel is also clear since the transactions of mobile payments have already been associated with the profitability of the Nigerian financial system, and in their case study, Okoro, et al. (2023) indicated that mobile payments had a positive and significant impact on the profitability of banks during the time in history they studied. Mobile payments transactions thus, constitute one of the key aspects of digital transformation since they include accessibility, convenience in transactions and quantifiable banking relevance in the Nigerian financial landscape.

Web Payments Transactions

Web payments transactions are money-based payment transactions which can be done by the medium of internet by use of online banking portals, web-enabled transfer systems, e-commerce interfaces, and other channels that are supported by the use of browsers. Web payments, unlike POS transactions, which rely on terminal contact with merchants, or mobile payments, which are often telephony-based, are often linked to online platforms where customers authorize transactions, pay bills and make online payments via internet-based connections. This channel belongs to the broader movement in the Nigerian payment system out of the paper instrument and branch-reliant transactions, and John, et al. (2020) provided a description according to which the cashless policy has reinforced the involvement of electronic channels in the payment system of Nigeria. On the bank-performance level, web banking has been studied explicitly in the context of the Nigerian deposit money bank, where Madugba, et al. (2021) have determined that the web banking was a part of the electronic banking system that strongly influenced the financial performance. More current data also concentrates on internet web transactions as an independent innovation channel whose impact should be analyzed as independent of other electronic products, and Olofin, et al. (2024) demonstrated that internet web transactions can have an effect on bank performance, even though the effect is not uniform across all the models. Web payments transactions signal the shift of banking business to internet payment environments where speed, traceability and flexibility of transactions is becoming a prized commodity.

Performance

Performance can be defined as how well a bank is performing in terms of the desired financial and operational results in the long run, particularly when it comes to profitability, efficiency, stability, and ability to turn resources available to it into productive use. In banking research, accounting ratios and similar indicators are typically operationalized as ratios typically permit evaluating whether the management decisions are bearing out to better institutional results. In the Nigerian context, profitability is one of the highest forms of performance, Osuagwu (2014) has observed that the performance of a bank is contingent on an amalgamation of internal organization, industry structure, and macroeconomic conditions. Performance also indicates the effectiveness of banks to balance liquidity, risk, and profit generation because Shaibu and Okafor (2020) found that profitability in Nigerian deposit money banks is tightly related to using liquidity management decisions and asset utilization. The governance aspects also expand the scope of performance since performance at institutions is not merely based on earnings but also includes an aspect of quality of oversight and strategic focus, as Ado, et al. (2024) showed that board characteristics are significantly linked to the financial performance of listed deposit money banks in Nigeria. Therefore, in this research, the definition of performance is the financial outcome of the effectiveness with which deposit money banks allocate resources, handle transactions and translate strategic decisions into quantifiable performance.

Return on Assets

Revenue on asset (ROA) is a profitability ratio that indicates the percentage of net income earned by the entire asset base of an institution. The reason why the ratio is popular in banking research is that it indicates how efficiently the management is using its assets to generate earners and unlike certain market-based measures,

the ratio directly correlates profitability with the resources given to the bank. ROA has also been a central accounting metric in the literature on the profitability of a bank since it measures the efficiency with which a bank has made use of total assets, and Adusei & Elliott (2015) used it as the ratio of net profits and total assets in their definition of profitability in their research on banks. The measure is also shared with modern researches on the performance of banks, as Shihadeh (2021) used ROA among the key indicators by which the performance of a bank can be analyzed in terms of financial inclusion. There is also comparative evidence in its use since Vo & Nguyen (2021) evaluated the bank performance of the Asian region by using ROA and other indicators of profitability, which highlights the applicability of the measure in the study of the impact of strategic and structural variables on the banking performance. ROA will be fitting in terms of this study since the deposit money banks in Nigeria keep heavily relying on the successful utilisation of assets, as asset-based profitability will be a fitting method to assess whether digital transformation will play into the greater performance.

Personnel Expenses to Gross Income Ratio

Personnel Expenses to Gross Income Ratio (PEGI) is an efficiency-based performance measure that indicates the ratio of the amount of gross income of a bank that is consumed by the staff. In the banking industry, the staff cost is one of the significant parts of operating cost as banks rely on employees to serve the customer, credit administration, risk management, compliance, digital operation and make strategic decisions. As such, PEGI can be used to demonstrate that a bank is making enough revenue as compared to the amount it spends on staffing. A low PEGI tends to show high-cost efficiency whereas a high PEGI tends to indicate that cost incurred in staffing is rising at a faster rate than the income earned. The banking literature that connects personnel related costs and cost-income efficiency with the performance of the banks supports the applicability of PEGI in the analysis of the banking performance. A study by Olarewaju, et al. (2017), on the Nigerian banks between the year 2004 and 2015 revealed that there exists a bidirectional causality between personnel ratio and cost-income ratio, which implies that the cost structure of staff is strongly related to operational efficiency in the Nigerian banking sector. On the same note, Almazari (2013) discovered a relationship between cost-income ratio and bank profitability, in terms of Return on Assets and Return on Equity, indicating that operating efficiency is a significant factor of banking performance. PEGI has found application especially in the Nigerian deposit money banking sector whereby the banks are in a competitive and tech savvy environment where success is not only determined by the growth of income but also the ability to manage the operating costs. Digital transformation might affect the cost efficiency of personnel since it can limit the reliance on manual processes, face-to-face service delivery and transaction handling that is labour intensive. Thus, PEGI will be suitable in this study since it has the power to gauge the level at which deposit money banks in Nigeria are capable of addressing staff related costs and transforming income generating activities to a measurable financial performance.

Return on Equity

Return on Equity (ROE) is a measure of profitability which is a percentage of how much a bank produces profit using the capital of the shareholders. It is usually determined as the net income/shareholders equity and it shows the level of profit gained on the capital invested by the owners of the bank. The reason why ROE is very common in banking studies is that it indicates how well the management utilizes equity capital in order to earn profits. Compared to Return on Assets, which is profitability based on the overall asset base, ROE is profitability based on shareholders. ROE is a significant indicator of bank performance since banks should have sufficient capital and at the same time generate decent returns to shareholders. In the study conducted by Almazari (2013), ROA and ROE were the two measures of bank profitability, and it was discovered that cost-income ratio and other variables specific to the bank had a significant correlation with profitability. In their research study on bank performance, Baselga-Pascual & Vahamaa (2021) also employed ROE as an accounting-based measure of profitability, which also contributes to its applicability as a typical measure of financial performance in banking studies. The reason why ROE is suitable is that digital transformation can affect the returns of shareholders by increasing the volume of transactions, lowering the operating expenses, expanding the reach of the customers and raising the amount of fees that are earned by the company on digital payment platform. The connection between the digital transformation and profitability is also supported by recent evidence in the banking sector. Citterio, et al. (2024) reviewed 279 European Union banks and

discovered that digital transformation is related to increased bank profitability, particularly, IT and network efficiency. Nguyen-Thi-Huong, et al. (2023), however, discovered that digital transformation can negatively impact the performance of banks, in terms of ROA and ROE, with the impact of digitalisation potentially being context-dependent, and influenced by the cost of implementation and institutional preparedness. Thus, ROE is embraced as a performance metric since it reflects how successful banks in Nigeria are in terms of digital transformation and strategic utilisation of resources into enhanced shareholder returns.

Digital Transformation and Performance

The connection to digital transformation and performance is often described by the fact that digital technologies enhance performance in terms of the speed of services, lower transaction costs, expand the reach of customers, and generate new sources of fee-based or platform-based revenues. This is the case in banking whereby the technology supported channels have the ability to change the efficiency as well as profitability in case they are effectively incorporated in the institutional processes. The Nigerian evidence highly suggests the applicability of this association, since the study by Ashiru, et al. (2023) revealed that financial innovation has a strong impact on the performance of deposit money banks and thus considers technological change as a significant determinant of the banking performance. This connection is also supported in the literature of emerging economies, with the Nigerian data, as Mustapha (2018) stated that the introduction of the e-payment technology has positively affected the performance of the bank and hence the profitability of payment innovation. A comparable operational explanation is in the technology-performance literature of Nigerian banks in which Adegbe, et al. (2020) posited that information and communication technology enhance sustainable performance by enhancing service delivery to customers and efficiency of banking services. The conceptual expectation of this study is such that an increased degree of digital transformation, which is manifested by the activities of the POS transactions, web payments transaction, and mobile payments is expected to produce a positive effect on the performance of deposit money banks in Nigeria under the condition of proper mobilisation and utilisation of these channels.

THEORETICAL FRAMEWORK

Dynamic Capability Theory

Teece, et al. (1997) are the most well-known associates of the Dynamic Capability Theory. According to the theory, sustained advantaging of firms is not just a result of their resources possession, but rather the ability to produce the capability of integrating, building, and reallocating of internal and external competences in reaction to shifting environments. Applying to banking, the theory implies that the only value generated by digital tools is the capacity of the institutions to be able to constantly align technology, people, routines and market opportunities. Within the context of the Nigerian banking system, this implies that POS systems, web payment infrastructure, and mobile payment platforms are not useful just because they are in place, but they can be used as tools of performance when banks have the capacity within the organization to implement them effectively, transform them to suit customer requirements and convert them into improved operational and financial results. The theory is thus very suitable in this study as digital transformation is essentially a reconfiguration issue where deposit money banks should feel the change in technology, grab newer digital chances, and digitally reshape their service framework in a manner that optimizes results.

Nevertheless, the Dynamic Capability Theory has come under critique due to the lack of conceptual depth as well as difficulty in measurement. Eisenhardt and Martin (2000) contended that dynamic capabilities can be defined as identifiable organizational processes that cannot be well valued in every market condition thus, they may not necessarily be rare and/or inaccessible in the strong sense commonly considered. This critique is important since banks can implement comparable digital platforms around the same timeframe, but they still beget varying results based on the quality of execution, time, and institutional environment. The other criticism here is that the theory can at times seem tautological in that successful adaptation then acts as evidence of the presence of the very ability it is asserting about and Arend and Bromiley (2009) believed that vague definitions compromise empirical testing. Such observations apply in this context since a bank can spend a lot of money in the digital channels without necessarily enhancing performance provided the institution lacks management coordination, security controls, customer education and process discipline to transform technology into action.

Nevertheless, even with such restrictions, it is the Dynamic Capability Theory that serves as the most appropriate anchor in this study since the model can offer a clear mechanism, which has the digital transformation as a cause and performance as an effect. In Nigeria, deposit money banks are operating in a place of regulatory transformation, the rise of fintechs, changing customer priorities, and increased reliance on electronic payment infrastructure, meaning that how well banks renew their capabilities and on which capabilities they restructure their operations determines performance. The theory can assist in explaining why digital channel can yield more significant results in one bank in comparison to another: it is not only the adoption that matters, but also the institutional capacity to integrate digital resources in service delivery, risk management, and customer experience. In this case, therefore, this research study is grounded on the Dynamic Capability Theory since it explains most on how the POS transactions, web payments transactions, and mobile payments transactions are likely to boost the functioning of the deposit money banks in Nigeria when they have been championed with adaptable structures, strategic alignment, and renewal of the capability.

Empirical Review

Iheanachor & Ozegbe (2020) examined the dynamic linkages between mobile money and banks' performance in Nigeria. Their examination took the *ex-post facto* plan and used the time-series evidence that utilized the mobile money market indicator in Nigeria and banking-industry indicator. With the autoregressive distributed lag model, as well as the Wald and causality tests, the authors examined the short and long-run relationships of mobile money and profit before tax and total assets. It was analyzed that the presence of mobile money and bank performance was not an isolated phenomenon, but rather had forward and backward causal relationships. The researchers have also discovered that mobile money activity changes could have a strong impact on the performance of banks, although the bank performance variables could also elucidate the pattern of mobile money growth. Based on that, the research found that the mobile money architecture in Nigeria already offers working incentives to banks to further develop digital services. Their study thus reinforces the view that the adoption of digital payment can fortify banking performance as long as banks embrace such platforms in their operating model successfully.

Madugba, et al. (2021) examined the impact of the electronic banking on the financial performance of the deposit money banks in Nigeria. The research design was *ex-post facto* research design in which the secondary data was collected as the Central Bank of Nigeria Statistical Bulletin, the National Bureau of Statistics, and published financial statements of sampled banks were used. The authors have first tested the data to normality, descriptive and multi-collinearity tests before estimation after which the hypotheses were tested using regression analysis. Their findings revealed a positive and significant relationship between ATM transactions with earnings per share and return on assets, POS transactions as well as NEFT with return on assets. Conversely, both returns on earnings per share and returns on assets were found to be statistically not significant with web banking. The authors thus came up with the conclusion that electronic banking has a significant impact on the financial performance of the Nigerian deposit money banks though the magnitude of the impact varies in different channels. They advised a better customer focus on NEFT, web, POS, and ATM utilizations to enhance the bank performance.

Abdulmalik, et al. (2022) evaluated the time-varying relationships between financial innovation and efficiency of deposit money banks in Nigeria. The researchers targeted the listed deposit money banks in the country and analyzed a list of 2016-2019 period with a panel of monthly observations. They were designed *ex-post facto* and data envelopment analysis was presented to estimate efficiency and autoregressive distributed lag cointegration process was applied to test the dynamic aspect of innovation and efficiency. Agency banking and USSD-related innovation measures were highlighted in the study as the modern avenues by which the Nigerian banks offer services beyond the traditional branch system. The results showed that the links between financial innovation and the bank efficiency were both in the forward and backward dynamic connections, and therefore, the relationship between innovation and bank efficiency positively supports each other in the long run. The authors concluded that, to ensure that the benefits of digital financial innovation are anchored, the Nigerian banks need to engage in continuous investment in information technology as well as human-capital development. Their conclusion concurs with the perception that continuity and scale determine performance gains as a result of transformation.

Ashiru, et al. (2023) explored the evidence of financial innovation and bank financial performance on Nigerian deposit money banks. This study assumed an ex-post facto design, and used annual data on the years 2012 to 2021, which was collected through the Nigeria Inter-Bank Settlement System, the Central Bank of Nigeria, and bank-breaking reports. The direction and a magnitude of the relationship between innovation and performance were estimated using the autoregressive distributed lag model and the Granger causality procedures by the authors. Their results indicated that financial innovation usually led to an improvement in the performance of commercial banks with POS banking services having the biggest impact due to the size and value of transactions made through this channel. They also indicated that mobile and internet enabled service proved to be beneficial to profitability even though channels were not as powerful across time. The research came up with a conclusion that the Nigerian banking industry gains as the banks multiply and make the best use of the electronic banking services instead of executing them as a peripheral delivery system. Results The research is thus solid empirical evidence to connect digital transformation with bank performance in Nigeria.

Ezie, et al. (2023) analyzed the effect of electronic banking on the performance of deposit money banks in Nigeria, through a dynamic ordinary least squares analysis. It was a planned ex-post facto study that used quarterly time-series data and spanned the 2009Q1- 2023Q1. It used return on assets as the primary performance metric with point-of-sale and cheque transactions as the explanatory variables in the long-run model. The authors aimed to use dynamic ordinary least squares to determine the long-term relationship between payment channels changes and the performance of banks. Their findings found a long-run positive significant relationship between POS transactions and returns on the assets which showed that the more that banks migrate to electronic channels, the better they make profits. There was also a positive correlation between cheque transactions, but the interpretative focus of the study was also more focused on the importance of POS activity. The authors concluded that electronic banking reinforced the bank performance in Nigeria and suggested the additional technological improvement to speed up the process of transferring the traditional instruments to the digital ones.

In a data-based study, Monday, et al. (2024) used panel data modeling to evaluate financial innovation and financial performance of Nigerian listed deposit money banks. The authors have chosen ex-post facto design and utilized nine internationally authorized, listed banks as the sample, and retrieved secondary data in annual reports and the Nigerian Exchange Group Factbook between the years 2008 and 2023. They used gainful generalized least squares regression in their analysis to determine the impact that automated teller machines, point-of-sale terminals, web banking, and mobile payments have on both the return on assets and the return on equity. The results revealed that financial innovations had a positive impact on the overall bank performance, although not at all the channels had equal impacts. ATM and POS transactions greatly enhanced the return on assets and the return on equity, and the web and mobile transactions were not statistically significant in that model. The authors arrived at the conclusion that Nigerian banks obtain more apparent performance benefits out of the channels of transaction that have already attained the nature of operational profundity and a wide familiarity at the customer level. Their writing offers a nuanced insight in that digital transformation is good, yet there are channels which are maturing faster than others when it comes to transferring the impact of profits.

Olofin, et al. (2024) have studied financial innovations and the financial performance of the listed deposit money banks in Nigeria. The research design used was ex-post facto, with all quoted deposit money banks within the period of 2010-2021 to be covered, and secondary data was used based on the annual report of the banks. The direction and significance of the relationship among the variables were determined in correlation analysis and multiple regression analysis. The results found ATM transactions and financial performance had a negative, significant interdependence, POS transactions and financial performance had a positive, significant dependence, mobile transactions and web transactions having negative irrelevant dependence. These mixed findings compelled the authors to reach the conclusion that these digital channels do not necessarily transfer into higher profits, particularly when the risk of frauds and other security-related issues and operating expenses are high. The research found that to achieve the full performance benefits of financial innovation, financial institution should enhance security architecture and customer-service responsiveness particularly to ATM channels and web channels. Their study is useful since it demonstrates the asymmetry in the quality of returns in channels of innovation.

Ologunwa, et al. (2024) conducted a study to understand the impact of financial technology on financial performance of Southwest Nigeria deposit money banks. The authors of the study assumed an ex-post facto design and synthesized the data of bank staff and institutional observations in the Southwest geopolitical zone. Perceived changes in return on assets, return on equity and net income were initially assessed using descriptive statistics followed by the use of regression estimates to analyze the contribution of automated teller machines, mobile banking, internet banking, and point-of-sale channels. The findings of the empirical study indicated that all the four channels had positive and significant impacts on the returns on assets, returns on equity and net income, with the most significant impact being experienced by mobile banking and internet banking. The smallest impact on the channels was made by automated teller machine progress, but it had a positive impact on the performance. Based on these findings, the authors were able to conclude that bank performance in Nigeria has been enhanced by financial technology amid active implementation of mobile banking and internet banking. They thus recommended that Nigerian banks should continue to invest in other delivery channels since the digital transformation has become core to the performance in competition.

In Mgbada, et al. (2024), each of the technological innovations was examined in terms of its impact on the financial performance of deposit money banks in Nigeria during the timeframe of 2010-2021. It used the ex-post facto design in which the secondary time-series data which were used was obtained at the Central Bank of Nigeria Statistical Bulletin. The authors approached the estimation of the relationship in the short run and the long run by defining internet banking, automated teller machines, and mobile banking as the key variables of innovation related to financial performance then applying the autoregressive distributed lag analysis. The results indicated that technological innovation is an important factor affecting the financial performance of deposit money banks in Nigeria with variances and times of the channels being influential in varying degrees. The paper highlighted that internet banking, automated teller machines and mobile banking have no longer been an option tool of support, but they have become the determinant of the efficiency and profile of profitability of banks. The study found that to maintain financial benefits of adoption of technology, the Nigerian banking sector should keep further reinforcing digital infrastructure and channel integration. Their contribution is based on the general body of literature to assert that innovation is at the centre of the bank performance dynamics.

Iyobo & Shaba (2025) discussed the presence of digital banking and the effectiveness of deposit money banks in Nigeria with the 2013-2023 data. The research took ex post facto design and approximated a multiple regression design, according to which automated teller machines, point-of-sales transactions, and mobile banking were the primary predictors of digital banking, and return on assets was the performance. In their analysis, it was revealed that mobile banking had the most significant positive impact on profitability, then ATM transactions followed by a positive impact, and lastly POS transactions contributed positively but less. The digital banking variables in aggregate explained a significant amount of the profitability change, indicating that the performance of the banks has become more and more dependent on the intensity of the use of digital transactions. The authors have decided that mobile banking must take a central stage in the profitability agenda of deposit money banks since it is a combination of convenience, scale, and relatively reduced service friction.

Money & Iyoha (2025) explored electronic banking opportunities and financial performance of the Nigerian banking system in the years 2000 to 2023. Their research took ex-post facto research design and the autoregressive distributed lag model to estimate the short-run and long-run dynamics between ATM, internet banking, mobile banking, point-of-sale channel and two performance measures, i.e., return on assets and financial deepening ratio. The mix pattern was reported in the results. Internet banking and mobile banking demonstrated statistically significant positive impacts on profitability although ATM and POS channels exerted negative impacts (which the authors attributed to high cost of operation and infrastructure). The impact of channels on financial deepening were not statistically significant and they do not imply that the gains in profits are always included in the outcomes of inclusive finance. The paper thus concluded that, in Nigeria, the nature of electronic banking is twofold, namely, it can increase the level of profitability when effectively scaled but, conversely, does not, in and of itself, enhance inclusion. Their research expands the performance argument by demonstrating that digital transformation can be easily directed to meet profit actors compared to system-wide developmental actors.

Using a sample of deposit money banks in Nigeria, Alagbe & Yinus (2025) investigated financial technology and financial performance. The researchers followed a survey design and administered questionnaires to six banking institutions and evaluated the available responses to the questionnaires using descriptive statistics and multiple regression analysis. Digital banking penetration, ATM transaction volume and internet banking usage were included as central explanatory variables in their model and utilised a Return on assets as a key variable of profitability. The empirical results indicated that there existed a strong positive correlation between the financial technology adoption and the performances of the bank and on that note, a large proportion of the variation of the returns on assets was identified with the fintech variables. The paper also revealed that digital banking behavior, particularly the use of ATMs and internet, continues to play significant role in profitability of the sampled institutions. They found that deposit money banks in Nigeria could enhance long-run profitability by investing in sophisticated digital infrastructure, maintaining the quality of services provided by the ATM machines, and enhancing cybersecurity. Their eruption is in line with the literature body that perceives digital transformation as an income strategy and a trust-building strategy.

Kolawole (2025) examined how electronic banking will impact the performance of the deposit money banks in Nigeria. The research was based on the secondary data of chosen banks financial reports and on the descriptive statistics and the estimation of the panel data in the analysis of the evidence. Electronic banking was considered to have core channels of impact on profitability in ATM, POS and mobile banking. The findings revealed that there was a significant positional effect of ATM transactions on profitability, POS produced a favorable and statistically significant effect, and the mobile banking also positively contributed towards its effect at the conventional rate of significance. The implication of this is that the branches of the major transaction channels of electronic banking have all performed favorably towards banking performance in the sample. Kolawole thus concluded that electronic banking is an important one that defines the performance of Nigerian deposit money banks and recommended banks to offer profitable, efficient and customer responsive services via POS and mobile systems.

Omenukwa & Gbalam (2025) explored the financial services and the performance of banks based on electronic financial services in Nigeria through a cross-sectional panel model. It was based on 2023 financial statements of the chosen commercial banks and the Central Bank of Nigeria Statistical Bulletin; and multiple regression with fixed effects was applied following the Hausman test conducted to choose the preferable model. The variables of performance used were profit after tax and liquidity whereas the key explanatory variables were digital lending, web payments, mobile banking, and ATM transactions. The findings revealed that the profit after tax and liquidity differences were described using electronic banking services to the extent of 71.3 percent and 77.4 percent, respectively. ATM, POS and mobile payment had positive associations with profit after tax and liquidity whereas web payments had negative associations with the same whereas electronic fund transfer enhanced liquidity, but deteriorated profits. Their conclusion is that electronic banking services increase the effectiveness of the banks in general, but the web-payment infrastructure still has to be streamlined. Their results are particularly applicable to the current research as they specifically isolate the web payment and mobile payment impacts in the Nigerian context.

Gbanador, et al. (2026) examined the financial innovation and deposit money bank performance in Nigeria during the 2009-2024. The research design was ex-post facto and secondary data generated by the Central Bank of Nigeria Statistical Bulletin, Nigeria Inter-Bank Settlement System reports and annual reports of specific banks were used. The authors estimated the models that were based on the EViews, i.e., the estimation was to be the return on the assets in relation to the ATM, internet banking, pos and mobile banking transactions. Their results showed that the overall impact of financial innovation on bank performance was significantly positive, and the innovation variables collectively forecasted a high overall share of the movement in the return on assets. More precisely, the ATM and mobile banking were found to exhibit pronounced positive impacts, internet banking positively altered the effect, but significantly in the negative, during the confirmed time frame. The authors found the results that financial innovation is now a significant driver of performance in deposit money banks in Nigeria, yet emphasized that more significant security, improved quality of service, and enhanced platform design is needed to ensure all channels can play a positive role. The work is one of the latest enhancements to the literature on digital banking-performance in Nigeria.

METHODOLOGY

The study design embraced in this research was ex post facto design. The choice of this design is justified by the fact that secondary data which is already in existence were used. So, the design fits the application of secondary data to achieve the aims of the research. Study population is all of the biannual data on digital transformation and performance of Deposit Money Banks in Nigeria between 2009-2024. Data used to carry out the study were secondary data. This means that secondary sources were used to extract data pertaining to this work. The secondary data were compiled by created bi-annual reports on the central bank of Nigeria (CBN) quarterly Statistical Bulletin 2024 and the CBN financial stability report in the years 2009-Dec 2024. The researcher adopted Archival Retrieval Technique (ART). The data available in the Statistical Bulletins of the Central Bank of Nigeria (CBN) and the CBN financial stability reports were considered using the method to draw out the semi-annual data.

The functional model is given:

$$ROA = f(POS, WPAY, MPAY) \quad \text{Model 3.1}$$

$$PEGI = f(POS, WPAY, MPAY) \quad \text{Model 3.2}$$

$$ROE = f(POS, WPAY, MPAY) \quad \text{Model 3.3}$$

Econometrically, the multiple linear regression models were employed, to put it another way. It is stated as:

$$ROA_t = \beta_0 + \beta_1 POS_t + \beta_2 WPAY_t + \beta_3 MPAY_t + \mu_t \quad \text{Equation 3.1}$$

$$PEGI_t = \beta_0 + \beta_1 POS_t + \beta_2 WPAY_t + \beta_3 MPAY_t + \mu_t \quad \text{Equation 3.2}$$

$$ROE_t = \beta_0 + \beta_1 POS_t + \beta_2 WPAY_t + \beta_3 MPAY_t + \mu_t \quad \text{Equation 3.3}$$

Further, the log form of the independent variables is given as:

$$ROA_t = \beta_0 + \beta_1 \ln POS_t + \beta_2 \ln WPAY_t + \beta_3 \ln MPAY_t + \mu_t \quad \text{Equation 3.4}$$

$$PEGI_t = \beta_0 + \beta_1 \ln POS_t + \beta_2 \ln WPAY_t + \beta_3 \ln MPAY_t + \mu_t \quad \text{Equation 3.5}$$

$$ROE_t = \beta_0 + \beta_1 \ln POS_t + \beta_2 \ln WPAY_t + \beta_3 \ln MPAY_t + \mu_t \quad \text{Equation 3.6}$$

Where;

$$ROA_t = \text{Return on Assets in period } t$$

$$ROE_t = \text{Return on Equity}$$

$$PEGI_t = \text{Personnel Expenses to Gross Income Ratio}$$

$$POS_t = \text{Point of Sales in period } t$$

$$WPAY_t = \text{Web Payment in period } t$$

$$MPAY_t = \text{Mobile Payment in period } t$$

$$\beta_0 = \text{Intercept or regression constant in period } t$$

$$\beta_1 - \beta_3 = \text{Regression coefficients to be estimated}$$

$$\mu_t = \text{Stochastic error term.}$$

t = Period

The research takes time-series econometric models to analyse both the short-run relationship and long-run relationship among the variables. Descriptive statistics are used to start the analysis, summarizing the distributional characteristics of the series and finding trends over time. The correlation analysis is then undertaken with the aim of finding out the direction and initial nature of association between the variables. A unit root test (e.g., Augmented Dickey-Fuller and/or Phillips-Perron) is used to identify the order of integration of each series and the stationarity properties. Using the unit root results, a co-integration process is used to determine whether there is a long-run equilibrium relationship between the performance and digital transformation proxies. At the point of co-integration, an error adjustment model is projected to estimate the pace of adjustment of the deviation short run to long run equilibrium, as well as, assessing the short-run impacts of the channels of digital transformation. Diagnostic tests post-estimation tests are done, such as serial correlation tests, heteroskedasticity tests, normality tests and stability tests, to determine adequacy and strength of the model inference. Analyses are all done in E-Views statistical software to make all the analyses uniform and accurate. The 5 percent level of significance (5 percent= 0.05) will be used to test hypotheses. The judgement criteria is informed by the probability value (p-value) of the test statistics. With p-value below or equal to 0.05, the null hypothesis is rejected which means that the input of the variable is statistically relevant. When the p-value exceeds 0.05 the null hypothesis is not rejected meaning that the estimated effect is not statistically significant, at the 5 percent level.

RESULTS AND FINDINGS

This section shows the empirical findings regarding the effect of digital transformation on performance of the deposit money banks in Nigeria. The independent variables are point-of-sale transactions (POS), web payment transactions (WPAY) and mobile payment transactions (MPAY) whereas the dependent variables include return on assets (ROA), personnel expenses to gross income ratio (PEGI) and return on equity (ROE). This includes 32 bi-annual observations of 2009H1-2024H2. To minimize scale effects and maximize linearity, the correlation, unit-root, cointegration, error-correction, diagnostic and regression models were converted to natural logarithms of transaction variables to achieve a better linearity and correlation as well as diagnostic and regression analysis.

Table 4.1: Descriptive Statistics of the Variables

| Statistic | ROA | PEGI | ROE | POS | WPAY | MPAY |
|--------------|----------|----------|------------|---------------|---------------|---------------|
| Mean | 1.8413 | 34.7356 | 21.5402 | 2,802,612.81 | 27,309,044.71 | 4,727,155.91 |
| Median | 1.9950 | 34.3500 | 18.7500 | 107,640.14 | 13,344.88 | 85,111.55 |
| Maximum | 5.5700 | 47.6000 | 265.5100 | 31,841,337.26 | 1.94E+08 | 50,284,471.46 |
| Minimum | -8.9000 | 23.0900 | -222.8000 | 800.00 | 1,370.00 | 50.00 |
| Std. Dev. | 2.2919 | 7.1431 | 63.4899 | 6,840,336.06 | 49,589,482.91 | 10,917,136.91 |
| Skewness | -3.0651 | 0.1450 | 0.0026 | 3.08 | 1.90 | 2.90 |
| Kurtosis | 16.5728 | 2.0392 | 14.5733 | 12.23 | 5.91 | 11.27 |
| Jarque-Bera | 295.7354 | 1.3430 | 178.5870 | 164.13 | 30.51 | 136.11 |
| Probability | 0.0000 | 0.5110 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Sum | 58.9200 | 1,111.54 | 689.2850 | 89,683,609.98 | 8.74E+08 | 1.51E+08 |
| Sum Sq. Dev. | 162.8329 | 1,581.75 | 124,960.10 | 1.45E+15 | 7.62E+16 | 3.69E+15 |
| Observations | 32.0000 | 32.0000 | 32.0000 | 32.00 | 32.00 | 32.00 |

Source: Researcher’s Computation (2026).

Table 4.1 reveals that the mean ROA of deposit money banks in the period was 1.8413 percent, mean PEGI and ROE were 34.7356 percent and 21.5402 percent respectively. The minimum and maximum values of ROA were -8.9000 percent and 5.5700 percent respectively, whereas ROE had a greater range of -222.8000 percent to 265.5100 percent. PEGI was comparatively less responsive than ROA and ROE with a value of between

23.0900 percent and 47.6000 percent. The mean value and standard deviation of POS, WPAY and MPAY were very large, and the way the digital payments transactions have grown and fluctuated rapidly in the period. Jarque-Brau results suggest that ROA, ROE, POS, and WPAY and MPAY were not normally distributed whereas PEGI was normally distributed approximately. This is also in line with the financial time-series data where the volume of transactions increases at a steep rate with time and the profitability ratios may be influenced by the stressful times in the banking-sector.

Correlation Analysis

The correlation matrix is presented in Table 4.2.

Table 4.2: Correlation Analysis Result

| Variables | ROA | PEGI | ROE | lnPOS | lnWPAY | lnMPAY |
|-----------|---------|---------|--------|--------|--------|--------|
| ROA | 1.0000 | | | | | |
| PEGI | -0.4925 | 1.0000 | | | | |
| ROE | 0.7576 | -0.1527 | 1.0000 | | | |
| lnPOS | 0.5061 | -0.9329 | 0.1175 | 1.0000 | | |
| lnWPAY | 0.3322 | -0.8287 | 0.0498 | 0.8964 | 1.0000 | |
| lnMPAY | 0.5045 | -0.9344 | 0.1261 | 0.9892 | 0.8910 | 1.0000 |

Source: Researcher’s computation (2026) using E-views 10.0

It is suggested by Table 4.2 that ROA is positively correlated with lnPOS, lnWPAY, and lnMPAY, which indicates that the more digital payments are made, the more likely it is that the assets will be profitable on a descriptive level. PEGI has negative relationships with the proxies of digital transformation, especially lnPOS and lnMPAY, which suggests a negative relationship between higher digitalization and lower personnel costs in comparison to gross income. ROE is positively and negatively connected with the digital variables, but the coefficients of correlation are low. The correlations between lnPOS, lnWPAY and lnMPAY are also very high, particularly between lnPOS and lnMPAY. This implies the eventuality of multicollinearity amongst the explanatory variables, which may dilute the statistical significance of each of the coefficients in cases where the explanatory variables are jointly significant.

Test for Stationarity: Augmented Dickey-Fuller Unit Root Test

The Augmented Dickey-Fuller (ADF) test that was used to decide the order of integration of the model variables was a unit root test that included the intercept and trend of the data. To accept or reject the null hypothesis of a unit root, the rule of thumb is to reject the null hypothesis when probability value is less than 0.05. The results have been indicated in Table 4.3.

Table 4.3: Augmented Dickey-Fuller Unit Root Test Results

| Variable | ADF t-Statistic (Level) | Lag | ADF t-Statistic (1st Diff.) | Lag | Order of Integration |
|----------|-------------------------|-----|-----------------------------|-----|----------------------|
| ROA | -2.197366 | 4 | -6.224737 | 2 | I(1) |
| PEGI | -6.176892 | 0 | -3.904283 | 4 | I(0) |
| ROE | -2.295624 | 4 | -3.774494 | 4 | I(1) |
| lnPOS | -2.493780 | 0 | -7.930088 | 0 | I(1) |
| lnWPAY | -2.328632 | 1 | -5.853476 | 0 | I(1) |
| lnMPAY | -2.020861 | 2 | -3.915498 | 1 | I(1) |

ADF test estimated with intercept and trend; lag length selected by information criterion.

Source: Researcher's computation (2026) using E-views 10.0

Table 4.3 displays the ADF results which reveal that ROA, ROE, lnPOS, lnWPAY and lnMPAY are non-stationary at level but turns stationary after the initial differentiation which is a sign of integration of order one, I(1). PEGI is at rest at level, which means I(0). Because no two of the variables are order two integrated, the study goes on to investigate the long-run residual behaviour of the three performance models and subsequently the short-run error-correction specifications are estimated.

Cointegration Test

The long-run behaviour of ROA, PEGI, ROE, lnPOS, lnWPAY, and lnMPAY was tested after having established that the variables are of order one integrated, by applying the Engle-Granger residual-based cointegration test. The null hypothesis is that the variables are not cointegrated. The result was Louisiana Purchase as provided in Table 4.4.

Table 4.4: Residual-Based Cointegration Test Results

| Model | Engle-Granger Tau-Statistic | Lag | Prob.* | Decision |
|-------|-----------------------------|-----|--------|---------------------------------|
| ROA | -6.685231 | 0 | 0.0000 | Reject no long-run relationship |
| PEGI | -7.195943 | 0 | 0.0000 | Reject no long-run relationship |
| ROE | -5.312215 | 0 | 0.0000 | Reject no long-run relationship |

Source: Researcher's computation (2026) using E-views 10.0

The long-run test based on residual is reported in table 4.4 of the three models. The tau-statistics of the ROA, PEGI and ROE models are all negative as compared to the 5 percent critical value. Thus, the null hypothesis of the absence of a long-run relation is rejected in the three performance equations. This means the digital transformation proxies and the performance indicators adjust in the same direction in the long-run although it may vary in the short-run.

Serial Correlation Test

The BreuschApostolou Serial Correlation LM test was applied to show whether or not the residuals of an estimated model are serially correlated. The lag length was two bearing in mind that the data was each after every two years. The null hypothesis is the fact that there is no serial correlation.

Table 4.5: Post-Estimation Diagnostic Test Results for the ROA Model

| Test Statistic | Value | Prob. |
|-------------------------------------|-----------|--------|
| Breusch-Godfrey F-statistic | 7.539241 | 0.0029 |
| Breusch-Godfrey Obs*R-squared | 11.575538 | 0.0031 |
| Breusch-Pagan-Godfrey F-statistic | 4.353970 | 0.0123 |
| Breusch-Pagan-Godfrey Obs*R-squared | 10.179291 | 0.0171 |
| White F-statistic | 15.400869 | 0.0000 |
| White Obs*R-squared | 27.616652 | 0.0011 |
| Jarque-Bera Statistic | 90.951030 | 0.0000 |
| Skewness of residuals | -1.801167 | — |
| Kurtosis of residuals | 10.432124 | — |
| Durbin-Watson Statistic | 2.250893 | — |

Source: Researcher's computation (2026) using E-views 10.0

In the case of the ROA model in Table 4.5, serial correlation results have shown that there is residual autocorrelation at the 5 percent level. The heteroskedasticity tests too are important and the Jarque Bera

statistic indicates that the residuals are not normally distributed. These findings imply that ROA estimates are subject to interpretation, especially when making inferences about individual coefficients. However, the Durbin-Watson value is near two and the model is still effective in studying the overall trend and the combined impact of the variables of the digital transformation.

Table 4.6: Post-Estimation Diagnostic Test Results for the PEGI Model

| Test Statistic | Value | Prob. |
|-------------------------------------|-----------|--------|
| Breusch-Godfrey F-statistic | 3.120448 | 0.0624 |
| Breusch-Godfrey Obs*R-squared | 6.191182 | 0.0452 |
| Breusch-Pagan-Godfrey F-statistic | 0.689226 | 0.5662 |
| Breusch-Pagan-Godfrey Obs*R-squared | 2.200559 | 0.5318 |
| White F-statistic | 0.544762 | 0.8261 |
| White Obs*R-squared | 5.831780 | 0.7566 |
| Jarque-Bera Statistic | 0.985393 | 0.6110 |
| Skewness of residuals | -0.367982 | — |
| Kurtosis of residuals | 3.444299 | — |
| Durbin-Watson Statistic | 2.526539 | — |

Source: Researcher's computation (2026) using E-views 10.0

In Table 4.6 regarding PEGI model, the BreuschGodfrey F-statistic at 5 percent is not significant but ObsR-Squared probability is slightly significant. Both tests of heteroskedasticity are insignificant and the Jarque-Bra probability value shows normally distributed residuals. Hence, PEGI model is the best in the three models in terms of diagnostic performance and offers a valid framework to explain the combined impact of digital transformation on the efficiency of personnel and cost.

Table 4.7: Post-Estimation Diagnostic Test Results for the ROE Model

| Test Statistic | Value | Prob. |
|-------------------------------------|------------|--------|
| Breusch-Godfrey F-statistic | 26.012364 | 0.0000 |
| Breusch-Godfrey Obs*R-squared | 20.529397 | 0.0000 |
| Breusch-Pagan-Godfrey F-statistic | 2.728288 | 0.0628 |
| Breusch-Pagan-Godfrey Obs*R-squared | 7.238266 | 0.0647 |
| White F-statistic | 2.434324 | 0.0429 |
| White Obs*R-squared | 15.966811 | 0.0676 |
| Jarque-Bera Statistic | 177.511760 | 0.0000 |
| Skewness of residuals | 0.993277 | — |
| Kurtosis of residuals | 14.366064 | — |
| Durbin-Watson Statistic | 1.928193 | — |

Source: Researcher's computation (2026) using E-views 10.0

In Table 4.7, when using the ROE model, the test of serial correlation shows that there is a residual autocorrelation. Breusch-Pagan-Godfrey is of trivial value and the White test indicates the potential heteroskedasticity of the F-statistic. The residuals are non-normal as well. These diagnostics suggest that the ROE model is less strong compared to the ROA and PEGI models and the regression outcomes should be viewed with skepticism.

Heteroskedasticity Test

Heteroskedasticity test was done to check that the residual variance of each of the estimated models is similar. They were done using the Breusch-Pagan-Godfrey tests and the null hypothesis is that there is no

heteroskedasticity. The rule to be used in deciding is to reject the null hypothesis in case the probability value is less than 0.05.

Table 4.8: Heteroskedasticity Test Results

| Model | Test Statistic | Value | Prob. | Decision |
|-------|-------------------------------------|-----------|--------|-------------------------------------------|
| ROA | Breusch-Pagan-Godfrey F-statistic | 4.353970 | 0.0123 | Reject H0; heteroskedasticity present |
| ROA | Breusch-Pagan-Godfrey Obs*R-squared | 10.179291 | 0.0171 | Reject H0; heteroskedasticity present |
| ROA | White F-statistic | 15.400869 | 0.0000 | Reject H0; heteroskedasticity present |
| ROA | White Obs*R-squared | 27.616652 | 0.0011 | Reject H0; heteroskedasticity present |
| PEGI | Breusch-Pagan-Godfrey F-statistic | 0.689226 | 0.5662 | Do not reject H0; no heteroskedasticity |
| PEGI | Breusch-Pagan-Godfrey Obs*R-squared | 2.200559 | 0.5318 | Do not reject H0; no heteroskedasticity |
| PEGI | White F-statistic | 0.544762 | 0.8261 | Do not reject H0; no heteroskedasticity |
| PEGI | White Obs*R-squared | 5.831780 | 0.7566 | Do not reject H0; no heteroskedasticity |
| ROE | Breusch-Pagan-Godfrey F-statistic | 2.728288 | 0.0628 | Do not reject H0 at 5%; marginal evidence |
| ROE | Breusch-Pagan-Godfrey Obs*R-squared | 7.238266 | 0.0647 | Do not reject H0 at 5%; marginal evidence |
| ROE | White F-statistic | 2.434324 | 0.0429 | Reject H0; possible heteroskedasticity |
| ROE | White Obs*R-squared | 15.966811 | 0.0676 | Do not reject H0 at 5%; marginal evidence |

Source: Researcher's computation (2026) using E-views 10.0

The probability values of the Breusch-Pagan-Godfrey and White tests in Table 4.8 are below 0.05, which means that the ROA model is heteroskedastic. The probability values in the PEGI model are greater than 0.05; therefore, the null hypothesis homoskedasticity is not rejected. The ROE model presents conflicting results since the results of Breusch-Pagan-Godfrey are not significant at the 5 percent level, and the white F-statistic is significant. Hence, ROE residual variance is to be viewed with caution.

Normality Test

A Jarque-Braun normality test was applied to check whether the residual of the estimated models are normally distributed. The null hypothesis is that the residuals follow a normal distribution with the alternative hypothesis that the residuals are not normally distributed.

Table 4.9: Normality Test (Jarque-Bera) on OLS Residuals

| Model | Jarque-Bera Statistic | Prob. | Skewness | Kurtosis | Decision |
|-------|-----------------------|--------|-----------|-----------|------------------------------------|
| ROA | 90.951030 | 0.0000 | -1.801167 | 10.432124 | Residuals not normally distributed |
| PEGI | 0.985393 | 0.6110 | -0.367982 | 3.444299 | Residuals normally distributed |
| ROE | 177.511760 | 0.0000 | 0.993277 | 14.366064 | Residuals not normally distributed |

Source: Researcher's computation (2026) using E-views 10.0

According to Table 4.9, the residuals of the ROA and ROE models do not follow a normal distribution since the Jarque-Bra probability ratios of the two are less than 0.05. The Jarque-Bra probability value of the PEGI model is however 0.6110 above the value of 0.05 implying that the model has normally distributed residues. The non-normality of ROA and ROE is in line with the fluctuating nature of banking performance indicators during the period.

Stability Test

The stability of the estimated coefficients was analyzed with the help of the CUSUM stability plots to determine whether the coefficients remained stable throughout the sample period. The rule of decision is that the model is stable when the CUSUM line is between the 5 percent critical points.

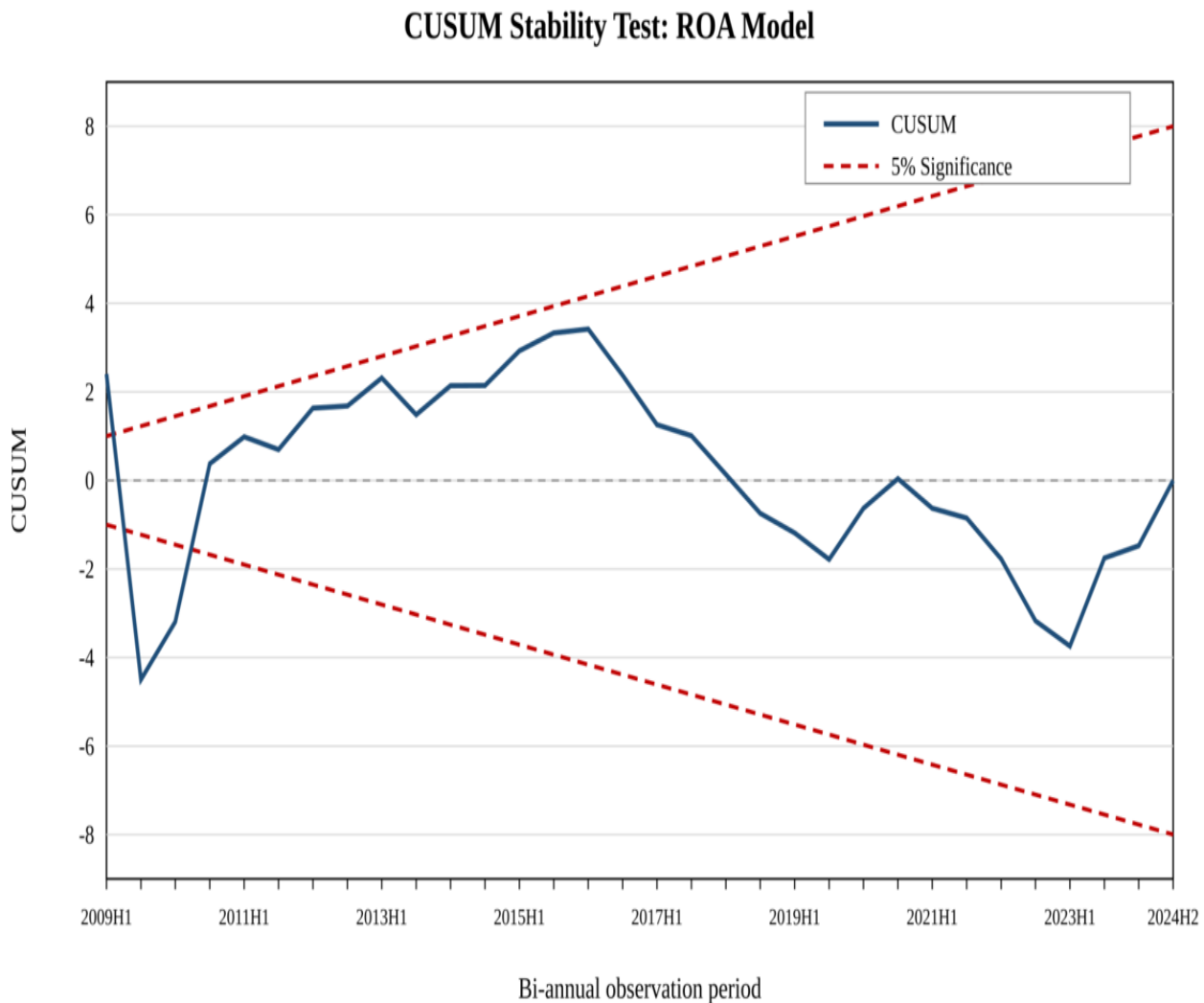
Table 4.10: CUSUM Stability Test

| Model | CUSUM Plot Result | Decision |
|-------|---------------------------|----------|
| ROA | Within 5% critical bounds | Stable |
| PEGI | Within 5% critical bounds | Stable |
| ROE | Within 5% critical bounds | Stable |

Source: Researcher's computation (2026) using E-views 10.0

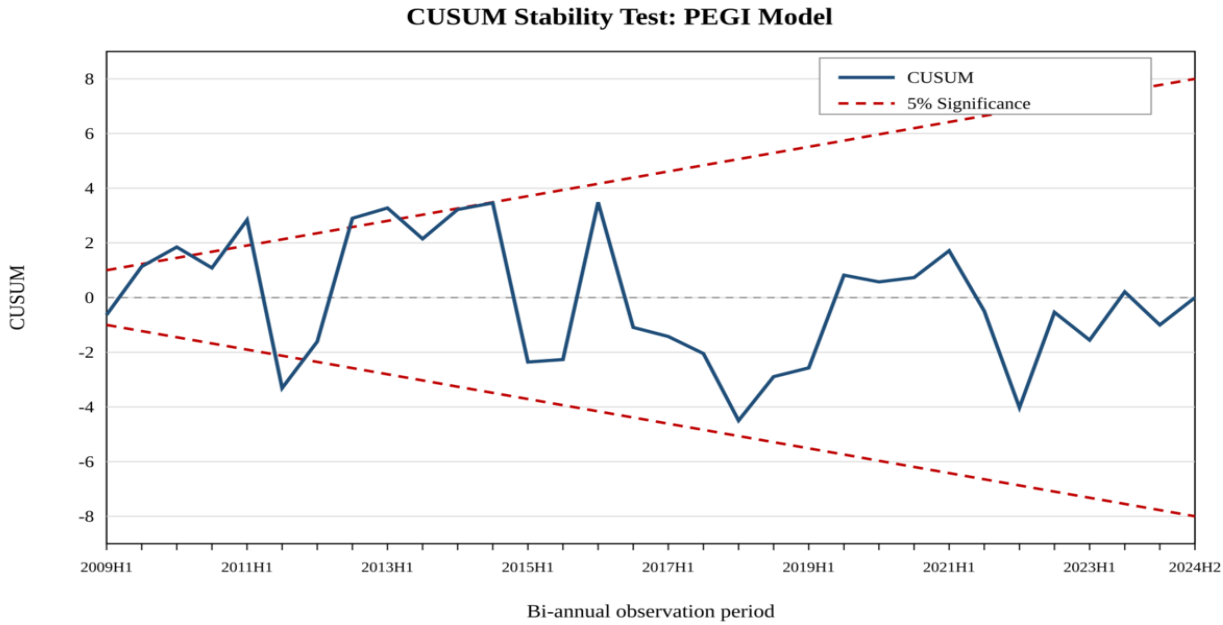
As indicated in Table 4.10, the CUSUM of the ROA, PEGI and ROE models are not beyond the 5 percent critical bounds. This means that the estimated coefficients will be constant through the study period and that the models do not exhibit significant structural instability.

Figure 4.1: CUSUM Stability Plot for the ROA Model



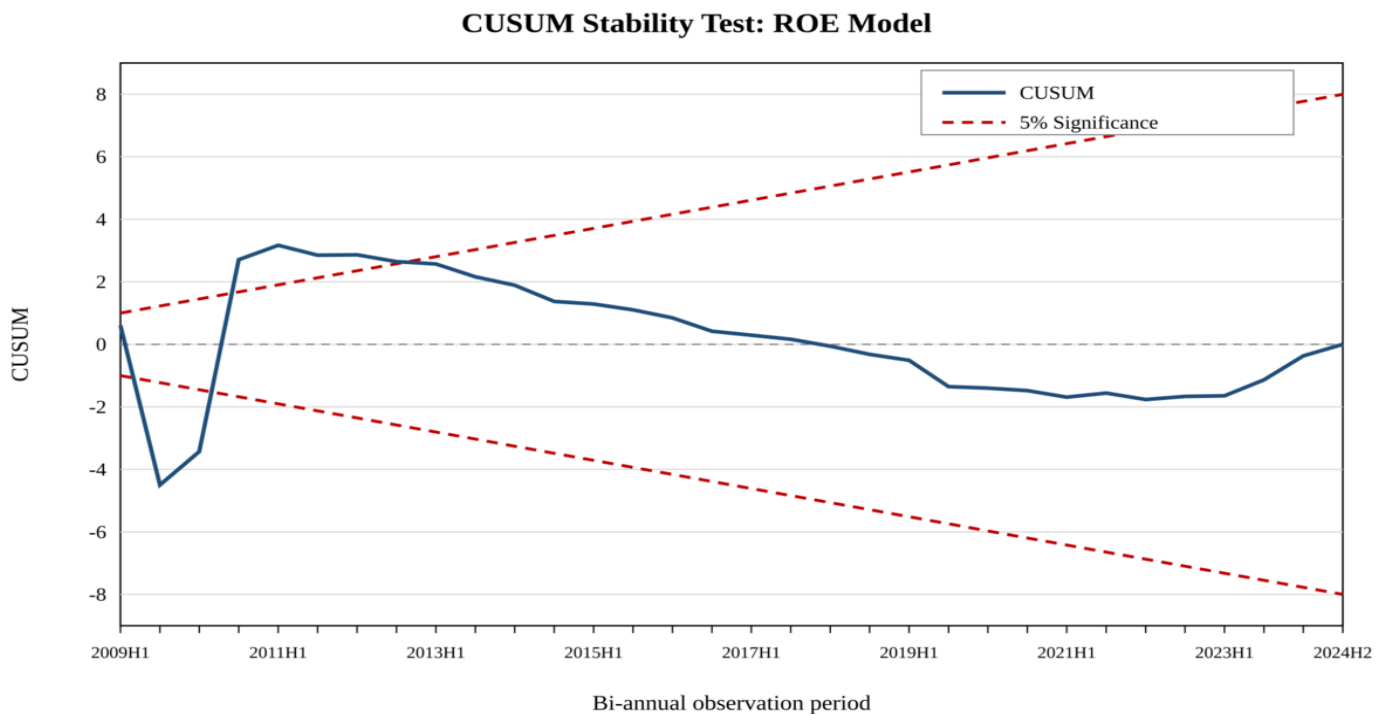
Source: Researcher's Computation (2026).

Figure 4.2: CUSUM Stability Plot for the PEGI Model



Source: Researcher’s Computation (2026).

Figure 4.3: CUSUM Stability Plot for the ROE Model



Source: Researcher’s Computation (2026).

The plots are inside the 5 percent critical limits, which means that the estimated parameters are generally stable over the period used in the study. This justifies the use of the estimated models to make inferences, subject to the diagnostic warnings mentioned above.

Regression Analysis

The probability value of the F-statistic of every multiple regression model was used to test the hypotheses since each hypothesis relates to the overall impact of digital transformation, which is represented by POS,

WPAY, and MPAY, on each performance measure. The null hypothesis is discarded at a probability value that is below or equal to 0.05.

H01: Digital Transformation have no significant impact on the Return on Assets (ROA) of deposit money banks in Nigeria.

Table 4.10: Ordinary Least Squares Regression Result for the ROA Model

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|--------------------|-------------|----------|
| C | -3.186922 | 2.009011 | -1.586314 | 0.1239 |
| lnPOS | 0.567542 | 0.799155 | 0.710177 | 0.4835 |
| lnWPAY | -0.316760 | 0.176853 | -1.791097 | 0.0841 |
| lnMPAY | 0.185212 | 0.651873 | 0.284123 | 0.7784 |
| R-squared | 0.333230 | Mean dependent var | | 1.841250 |
| Adjusted R-squared | 0.261790 | S.D. dependent var | | 2.291872 |
| S.E. of regression | 1.969157 | | | |
| F-statistic | 4.664487 | | | |
| Durbin-Watson stat | 2.250893 | | | |
| Prob(F-statistic) | 0.0091 | | | |

Source: Researcher’s Computation (2026) using E-views 10

The estimated ROA equation is stated as:

$$ROA_t = -3.1869 + 0.5675lnPOS_t + -0.3168lnWPAY_t + 0.1852lnMPAY_t + \mu_t.$$

The coefficient of determination (R-squared) is 0.3332, which implies that the three digital transformation proxies explain the change in the value of return on assets worth an overall of 33.32 per cent. The F-statistic 5 per cent probability of 0.0091 is an indication that regressors are significant as a group, thus, the digital transformation variables collectively explain the variation in the performance of banks. Individually, lnPOS has a positive coefficient (0.5675) yet statistically non-significant as the chance of it being positive (0.4835) is more than 0.05. The coefficient, lnWPAY, is negative (-0.3168), but not significant at the 5 per cent level, but again, it is close to the 10 per cent level. The coefficient of lnMPAY is positive (0.1852) but insignificant. The result therefore shows that, online payment channels provide more connections that create the possibility to describe ROA as compared to single channel that describe it at the sample period. This implies that digital transformation jointly influences the return on assets of deposit money banks in Nigeria.

H02: Digital Transformation have no significant impact on the Personal Expenses to Gross Income (PEGI) ratio of deposit money banks in Nigeria.

Table 4.11: Ordinary Least Squares Regression Result for the PEGI Model

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|--------------------|-------------|-----------|
| C | 57.642508 | 2.688851 | 21.437597 | 0.0000 |
| lnPOS | -1.000782 | 1.069586 | -0.935672 | 0.3574 |
| lnWPAY | 0.079787 | 0.236699 | 0.337084 | 0.7386 |
| lnMPAY | -1.054779 | 0.872464 | -1.208966 | 0.2368 |
| R-squared | 0.877044 | Mean dependent var | | 34.735625 |
| Adjusted R-squared | 0.863870 | S.D. dependent var | | 7.143131 |
| S.E. of regression | 2.635511 | | | |
| F-statistic | 66.574741 | | | |
| Durbin-Watson stat | 2.526539 | | | |
| Prob(F-statistic) | 0.0000 | | | |

Source: Researcher’s Computation (2026) using E-views 10

The estimated PEGI equation is stated as:

$$PEGI_t = 57.6425 + -1.0008\ln POS_t + 0.0798\ln WPAY_t + -1.0548\ln MPAY_t + \mu_t.$$

The digital transformation variables used in the PEGI model have an R-squared of 0.8770, which implies that the variables used together explain approximately 87.70 percent of the change in personnel expenses to gross income ratio. The F-statistic is 0.0000 with probability of 1, meaning that the joint effect is strong and statistically significant. The coefficients of $\ln POS$ and $\ln MPAY$ are negative, indicating that the expansion of POS and mobile payment could have a negative impact on the intensity of personnel costs, but the effects of their respective effect are not statistically significant at the 5 percent level. $\ln WPAY$ has a positive, but not significant coefficient. The outcome suggests that digital transformation is closely associated with cost-efficiency performance when the channels are looked at as a single entity. Therefore, the digital transformation has a considerable combined impact on the ratio of personnel costs to gross income of deposit money banks in Nigeria.

H02: Digital Transformation have no significant impact on the Return on Equity (ROE) ratio of deposit money banks in Nigeria.

Table 4.12: Ordinary Least Squares Regression Result for the ROE Model

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|--------------------|-------------|-----------|
| C | -1.690807 | 66.943662 | -0.025257 | 0.9800 |
| $\ln POS$ | -2.729083 | 26.629212 | -0.102485 | 0.9191 |
| $\ln WPAY$ | -4.128410 | 5.893029 | -0.700558 | 0.4894 |
| $\ln MPAY$ | 8.883690 | 21.721511 | 0.408981 | 0.6857 |
| R-squared | 0.035279 | Mean dependent var | | 21.540156 |
| Adjusted R-squared | -0.068084 | S.D. dependent var | | 63.489927 |
| S.E. of regression | 65.615664 | | | |
| F-statistic | 0.341312 | | | |
| Durbin-Watson stat | 1.928193 | | | |
| Prob(F-statistic) | 0.7956 | | | |

Source: Researcher’s Computation (2026) using E-views 10

The estimated ROE equation is stated as:

$$ROE_t = -1.6908 + -2.7291\ln POS_t + -4.1284\ln WPAY_t + 8.8837\ln MPAY_t + \mu_t.$$

The ROE model has a low R-squared of 0.0353, which means that POS, WPAY, and MPAY are only able to explain 3.53 percent of the variation in return on equity. The F-statistic is 0.7956 with the probability exceeding 0.05. Thus, digital transformation does not significantly jointly affect ROE during the period in question. Individually, the coefficients of $\ln POS$ and $\ln WPAY$ are negative, insignificant, whereas $\ln MPAY$ is positive, insignificant. This implies that other bank-specific and macroeconomic factors in addition to the digital payment channels sampled in this research affect shareholder return. Therefore, the joint impact of digital transformation on the return on equity of deposit money banks in Nigeria in the period under analysis is not significant.

DISCUSSION OF FINDINGS

Findings are discussed in terms of the three hypotheses of the study. The methodology is suitable since the hypotheses test the combined influence of digitalization, measured by the point-of-sale transaction (POS), web payment transactions (WPAY), and mobile payment transactions (MPAY) on each of the performance indicators of the deposit money banks in Nigeria. Thus, the interpretation concentrates on the statistical behaviour of each model in general and it also describes the direction of the individual digital transformation channels of the models.

Digital Transformation and Return on Assets

The initial hypothesis was that digital transformation does not have a profound effect on the returns on the assets of the deposit money banks in Nigeria. The regression outcome of the ROA model had an F-statistic of 4.6645 with a probability value of 0.0091. The null hypothesis was rejected since the probability value is less than 5 percent level of significance. This implies that the joint effect of digital transformation (measured by POS, WPAY, and MPAY) on the return on assets of deposit money banks in Nigeria is statistically significant. The implication of the finding is that overall increase in digital payment channels has a significant role to play in the capacity of banks to generate profit on their asset base. The outcome aligns with the dynamic capability perspective since banks are more likely to gain performance advantages when digital channels are part of more extensive operational capability as opposed to being single technological products. The result is also consistent with other studies like Ashiru, et al. (2023), Ezie, et al. (2023), and Monday, et al. (2024), who found that electronic and digital banking channels affect the performance of Nigerian deposit money banks. The low individual coefficients however corroborate the mixed evidence in Olofin, et al. (2024) and Omenukwa and Gbalam (2025) whereby there were some digital channels which were found to have a very weak or negative impact on performance. The implication is that the digital transformation applies to ROA, and the banks need to work on the cost of transactions, security risk, the reliability of the infrastructure, and customer experience before the discrete channels can produce more powerful independent profitability effects.

Digital Transformation and Personnel Expenses to Gross Income Ratio

The second hypothesis was that digital transformation does not have a significant impact on the ratio of personnel to gross income of deposit money banks in Nigeria. PEGI model has given an F-statistic of 66.5747 and probability of 0.0000. The probability value is below 0.05 hence the null hypothesis was rejected. This implies that digital transformation has a strong combined impact on the staffing costs-to-gross income ratio of the deposit money banks in Nigeria. In addition to the above, the R-squared value of 0.8770 also reflects that a very high percentage of the variation in PEGI is explained by POS, WPAY, and MPAY together. This is a good pointer that the digital transformation is firmly connected with the cost-efficiency model of deposit money banks. But the combined importance of the model demonstrates that the overall impact of digital transformation on the efficiency of the functioning is an essential factor. The observation confirms the argument that digital banking channels do not simply influence profitability, but also transform the internal cost structure of banks. It can be compared to Olarewaju, et al. (2017), who associated personnel-related ratios with cost-income efficiency in Nigerian banks, and Almazari (2013), who highlighted the applicability of cost-income efficiency to the performance of banks. The implication is that the digital transformation can be a cost-management tool by the deposit money banks, but they should make sure that web-payment systems do not generate unnecessary technical and support costs that diminish the efficiency gains.

Digital Transformation and Return on Equity

The third hypothesis was that the digital transformation does not significantly influence the return on equity of the deposit money banks in Nigeria. The F-statistic of the ROE model was 0.3413 and the probability value was 0.7956. The null hypothesis was not rejected as probability is greater than 0.05. This implies that the joint impact of digital transformation on return on equity of deposit money banks in Nigeria is not statistically significant in the course of the study. The R-squared of 0.0353 also indicates that the POS, WPAY and MPAY, together, only account for some 3.53 percent of the change in ROE. This suggests that the alterations in the returns of shareholders were mostly attributed to other factors other than the digital transformation proxies employed in this paper. The insignificant ROE outcome means that the digital transformation can have a more direct impact on the operational performance and cost efficiency than on the return of shareholders during the study period. ROE depends on the overall profitability, capitalization, leverage, exposure to risk, dividend policy, macroeconomic factors and management decisions at the bank level. Thus, although digital banking can enhance the amount of transactions or the efficiency of the operations, the advantage might not be great enough to generate a significant difference in the equity returns of the shareholders. This observation aligns with the mixed results in Nguyen-Thi-Huong, et al. (2023), whereby it was found that digital transformation might positively or negatively affect bank performance based on the cost of implementation and institutional preparedness. It contributes to the notion that the digital transformation cannot be considered an automatic

generator of shareholder value, either. Rather, banks should strategically turn digital adoption into greater margins, reduced expenses, client retention, risk management, and sustainable profits prior to it being able to make a substantial contribution to ROE.

CONCLUSION AND RECOMMENDATIONS

The research concludes that digital transformation impacts the performance of the deposit money banks in Nigeria in different ways based on the performance indicator used. In the case of return on assets, the joint effect is considerable in that POS, WPAY, and MPAY have a combined impact on the capacity of banks to make a profit on the asset base. The joint influence of digital transformation on personnel expenses to gross income ratio is also high, meaning that digital banking channels are closely related to operational cost-efficiency and management of expenses associated with staff in comparison to income. But on the side of return on equity, there is no notable combined impact of digital transformation meaning that the expansion of digital payment gateways has yet to translate into an impressive and quantifiable rise in shareholder returns. In general, the research finds that digital transformation has significance to the performance of banks in Nigeria, although its effects are greater in terms of assets utilization and cost-efficiency than equity-based profitability.

Based on the findings and conclusion of the study, the following recommendations are made:

- i. Deposit money banks are advised to enhance the incorporation of POS, web payment and mobile payment systems in their asset-utilization and income-generating modes. Given that digital transformation has a strong impact on ROA, banks need to enhance the reliability of digital infrastructure, minimize rates of transaction failures, enhance cybersecurity, and increase the levels of merchant and consumer adoption to ensure that an increasing volume of digital transactions can be more directly associated with an increase in asset-based profitability.
- ii. Digital transformation needs to be a conscious cost-reduction measure deployed by deposit money banks. As digital transformation is a major driver of PEGI, the bank management must automate routine transactions, enhance self-service platforms, and rearchitecture branch operations in such a manner that alleviates cost pressure associated with unnecessary personnel. Nevertheless, the banks are also expected to keep an eye on the price of technical support, cybersecurity personnel, and web-platform maintenance to ensure that efficiency of POS and mobile channels is not neutralized by the increase in cost of digital support.
- iii. Deposit money banks ought to aim at turning the digital transformation into greater shareholder value. Because the impact of digital transformation on ROE was not found to be significant, banks must stop increasing channels, and focus on profitability per transaction, optimizing fee-income, retaining customers, controlling risks, and recovering costs of digital investments. This will assist in ensuring that growth in digital banking benefits not only in efficiency in operations but also better returns on equity of shareholders in the long run.

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