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DIGITAL BANKING AND OPERATIONAL EFFICIENCY OF DEPOSIT MONEY BANKS IN NIGERIA

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Abstract

The study examined the effect of Digital Banking on the operational efficiency of deposit money banks (DMBs) in Nigeria over the period 2018 to 2024. Seven deposit money banks were purposively selected, and data obtained from their annual financial statements were analyzed using a Fixed Effects Panel Regression model with robust standard errors. The Hausman specification test confirmed the appropriateness of the Fixed Effects model ($p < 0.05$). Automated Teller Machines (ATM), Mobile Banking, Point of Sale (POS), and Unstructured Supplementary Service Data (USSD) were used as proxies for Digital Banking, while the Cost-to-Income Ratio (CIR) served as the proxy for operational efficiency. The empirical findings revealed that POS transactions have a negative and highly significant effect on CIR ($p < 0.01$), suggesting that POS infrastructure enhances operational efficiency by reducing relative operating costs. Conversely, ATM usage exhibited a positive and marginally significant effect on CIR ($p < 0.10$), indicating that ATM operations tend to increase operating costs and reduce efficiency. Mobile banking and USSD channels showed statistically insignificant effects on operational efficiency, which may reflect overlapping effects and shared variance among digital banking channels within the model. Consequently, the study recommends that Nigerian banks expand POS networks, optimize ATM infrastructure to reduce operational overheads, and strengthen the integration of mobile and USSD platforms to improve cost efficiency and achieve scale benefits.

Keywords: Digital Banking, Cost to Income Ratio, DMBs, Operational Efficiency.

INTRODUCTION

Operational Efficiency is a major reason for the adoption of Digital Banking Services among Deposit Money Banks (DMBs) in Nigeria. A major benefit of this action by DMBs is seen in the reduction of cost, which leads to higher profits, and a second benefit being the satisfaction of customers and the possibility to reach new customers which could also lead to increased revenue. Operational Efficiency refers to the ability of financial institutions to streamline processes, reduce redundancy, and minimize human error through innovations such as mobile banking, USSD, and POS systems (Afolabi and Aribaba 2025). Efficiency here means faster turnaround times and improved service delivery. Operational Efficiency is measured as the ratio of operating expenses to interest income. In banking, this reflects how effectively a bank uses its resources to generate income while minimizing costs. Financial Technological innovations such as mobile banking, AI-driven credit evaluation, block chain-based settlement, and automated payment systems, enhance efficiency by reducing manual errors, accelerating transaction processing, and lowering reliance on physical branch networks. Operational efficiency reflects a bank's ability to maximize outputs while minimizing inputs, which is typically, assessed using the cost-to-income ratio, which measures operating expenses relative to operating income. A lower ratio indicates that the bank is converting income into net returns more effectively, with fewer costs involved.

Digital banking services in DMBs in Nigeria have replaced traditional banking services with a major goal for this move being the need to improve operational efficiency. Credit is also given to various policies of the Government on Cashless Policy through the Central Bank of Nigeria (CBN). These services, which include USSD, Automated Teller Machines (ATM), Bank Mobile Applications, Point of Sales (POS) terminals etc. are adopted by DMBs with a view of improving their efficiency. It is worthy of note to mention that the adoption of these services have also improved customer satisfaction rates and have made banking easier in Nigeria (Akani and Obiosa 2020). This has led DMBs to invest very huge amounts of money in technology including the purchase of hardware, paying of software licenses and cost of training personnel to operate these technologies. These has led to great improvement in banking transactions and reduction in operating costs.

Notwithstanding these advancements, considerable challenges remain. Many DMBs contend with issues such as service unreliability, technological limitations, and cybersecurity threats, which in

turn negatively affect their operational efficiency (Fabian and Emeka, 2022). If these adopted technologies do not function optimally, the efficiency of DMBs may be same as when traditional banking operations were in place in the banking sector of Nigeria. Understanding the impact of all these on the efficiency of a bank's operation is very important for DMBs in Nigeria. The significance of this study is in offering to bridge the literature gap that exists on the subject matter, by specifically focusing on the relationship between digital banking operations and operational efficiency of DMBs. Prior studies have largely focused on the effects of digital banking on banks' financial performance and customer satisfaction (Musa and Abubakar, 2022; Yua and Akwam, 2021), creating a need for research examining their influence on operational efficiency. By filling this gap, the present study offers valuable insights for bank managers, and financial technology providers aiming to improve efficiency and service delivery within an increasingly digitalized banking environment.

This study focuses on DMBs in Nigeria, which offers a highly relevant context for examining these issues. Over the past decade, the country has witnessed a significant expansion in digital payments, driven by regulatory initiatives of the CBN, such as the cashless policy, mobile money frameworks, and real-time payment systems. The volume and value of electronic transactions have grown substantially, fundamentally reshaping payment intermediation and banking operations. This study seeks to assess the Impact of Digital Banking activities on the Operational Efficiency of Deposit Money Banks in Nigeria. Specifically, the study has the following objectives;

i. Determine the effect on Unstructured Supplementary Service Data (USSD) on the operational efficiency of Deposit Money Banks in Nigeria.
ii. Examine the impact of mobile banking on the operational efficiency of Deposit Money Banks in Nigeria.
iii. Investigate the effect of Automated Teller Machines (ATM) on operational efficiency of Deposit Money Banks in Nigeria
iv. Assess the impact of Point of Sales (POS) on operational efficiency of Deposit Money Banks in Nigeria.

The study will also test the following hypothesis;

i. Unstructured Supplementary Service Data (USSD) has no significant effect on the operational efficiency of Deposit Money Banks in Nigeria.
ii. There is no significant effect of Mobile banking on the operational efficiency of Deposit Money Banks in Nigeria.
iii. Automated Teller Machines (ATM) has no significant effect on operational efficiency of Deposit Money Banks in Nigeria
iv. Point of Sales (POS) has no significant effect on operational efficiency of Deposit Money Banks in Nigeria.

LITERATURE REVIEW

Digital Banking

Digital banking comprise a broad range of electronic and mobile-based platforms that enable financial transactions without the need for physical bank visits. According to Afolabi and Aribaba 2025, Digital banking is the design, development, and implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance. Digital Finance refers to the application of advanced digital technologies to the provision of financial services with the aim of improving efficiency, innovation, and customer experience (Gomber et al., 2018). Enoruwa et al. (2019) assert that digital banking has evolved into a strategic resource for enhancing operational efficiency, improving control mechanisms and reducing costs by replacing paper-based and labor-intensive processes with automated systems. These advancements ultimately contribute to increased productivity. In comparison to traditional systems, digital banking platforms are significantly more flexible, allowing banks to introduce and scale new features with greater speed. The integration of high-level process automation and web-based services forms a core foundation of digital banking, delivering enhanced cost efficiency. Oyobo and Shaba (2025) defined Digital banking as the use of automated delivery mechanism in the provision of services. Through real-time transaction capabilities and expanded outreach, these services address diverse operational challenges encountered in the past. Nevertheless, persistent challenges such as infrastructural deficiencies, security concerns, and service reliability issues underscore the need for ongoing investment in technology and customer-centric innovations to fully harness the potential of digital banking within the banking sector in Nigeria (Ashiru, et al

2023). Enadeghe and Mohammed (2025) said that digital banking has become a strategic resource for banks, improving efficiency, competitiveness, service quality, and profitability by reducing operational costs and expanding financial services.

Operational Efficiency

In the banking world, operational efficiency is essentially the art of doing more with less—without cutting corners. It is about managing people, technology, and capital so effectively that you lower overhead costs while actually making your services faster and more reliable for the customer. According to Berger & Humphrey (1997), it is a bank's ability to streamline its internal engines to deliver products at the lowest possible cost, all while maintaining a gold standard for quality and customer support. Operational Efficiency is a vital health check for a bank. It measures how effectively an institution can provide services at a lower cost without sacrificing customer satisfaction or its edge over the competition (Oino, 2018). Within the Nigerian banking sector, there is the need to optimize financial and human resources while streamlining internal workflows. DMBs must navigate the complex Nigerian landscape which is defined by high service costs, a fragmented socioeconomic demographic, and uneven digital infrastructure, all in a bid to stand out among competitors in terms of service delivery and profitability (Uchenna et al 2025).

Operational efficiency is a bank's ability to maximize outputs while minimizing inputs and is typically assessed using cost-to-income ratios. Sathye (2005) describes operational efficiency as the smart use of people, equipment, materials, and money to meet a bank's goals. Improving how any of these resources are used can increase output while lowering costs. According to Kim and Kim (1997), as cited by Mboma (2006), it is a strategic effort to maintain a healthy balance between spending and results by cutting waste and optimizing resources. Ultimately, it is a company's ability to deliver high-quality products and support to customers quickly and at the lowest possible cost.

Theoretical Review

Resource-Based View (RBV) Theory

The Resource-Based View (RBV), developed by Barney (1991), posits that an organization's ability to achieve and sustain superior performance depends largely on its possession and effective

deployment of valuable, rare, inimitable, and non-substitutable (VRIN) resources. The theory emphasizes that firms gain a competitive advantage when they utilize unique resources and capabilities that competitors cannot easily replicate. In the banking industry, technological innovations and digital banking infrastructure constitute strategic resources that can enhance service delivery, reduce operational costs, improve transaction speed, and strengthen overall operational efficiency. Within the context of deposit money banks, digital banking platforms such as Automated Teller Machines (ATMs), Point-of-Sale (POS) terminals, mobile banking applications, and Unstructured Supplementary Service Data (USSD) channels represent important technological assets. When effectively managed and integrated into banking operations, these resources can streamline service processes, increase customer convenience, reduce reliance on physical branches, and improve operational efficiency. Consequently, banks that invest in and effectively utilize digital banking technologies are more likely to achieve superior operational outcomes compared to competitors with less developed digital infrastructures.

The Resource-Based View is considered suitable for this study because it provides a theoretical explanation of how digital banking resources can contribute to improved operational efficiency among deposit money banks in Nigeria. The theory suggests that banks that effectively deploy and continually enhance their digital banking capabilities are better positioned to reduce operating costs, improve service delivery, and achieve greater operational efficiency.

Technology Acceptance Model Theory

Technology Acceptance Model (TAM) was developed by Fred Davis in 1989. It identifies the perceived ease of use and perceived usefulness as the two factors that drive technology adoption. Perceived ease of use focuses on simplicity. Perceived usefulness measures how effectively a tool solves problems or meets organizational needs. Technology that is straightforward and easy to operate experiences higher usage and wider diffusion and Technologies seen as highly beneficial see faster adoption rates. In the context of this study, when banks embrace digital banking because it is easy and useful, it directly boosts bank efficiency. The theory suggests that the adoption of digital channels directly improves the operational efficiency of Nigerian commercial banks by streamlining processes, reducing costs, and increasing automation. Various scholars have explored how technology adoption influences performance. Everett Rogers, Clayton M. Christensen, and

Michael E. Porter have analyzed the dynamics of innovation and its organizational effects. More specifically, Yousafzai (2012) notes that digital banking has transformed traditional operations by streamlining remote access, while Martins et al. (2014) argue that these technological advancements allow banks to deliver services more efficiently, fostering overall growth. This theory relates to this study due to the fact that as DMBs adopt digital banking and other technological innovations, they are able to navigate their complex operations with reduced cost and time, thereby improving their efficiency.

Empirical Review

Uchenna et al 2025 investigated the impact of Automated Teller Machines (ATMs) and agency banking on the operational efficiency of deposit money banks in Nigeria for the period 2009 to 2023. Employing an ex post facto research design, the study focused on ten deposit money banks listed on the Nigerian Exchange Group (NGX) as of 31 December 2023. Their findings revealed that ATMs exert a significant positive effect on operational efficiency, while agency banking, measured through Point of Sale (POS) systems, also demonstrated a statistically significant contribution. The study therefore concludes that technological advancements, particularly ATMs and agency banking, play a crucial role in enhancing the operational efficiency of Nigerian deposit money banks. A gap identified in this study is the consideration of only ATMs and POS systems, leaving out other channels of digital banking. Marshal 2024 in his study on the effect of digital banking technology adoption on the operational efficiency of Nigerian commercial banks. The study adopted a quasi-experimental research design, the study utilizes financial time-series analysis to provide empirical evidence. The findings demonstrated a significant and positive relationship between the integration of digital banking technologies and the performance of commercial banks and suggested that policymakers and industry stakeholders should prioritize strategic initiatives that promote technological adoption to optimize the operational efficiency of the Nigerian banking sector.

Afolabi and Aribaba (2005) investigated the impact of financial technology (Fintech) on the operational efficiency of DMBs for the period spanning 2014 to 2023. The empirical results indicated a significant negative relationship between internet banking and operational efficiency. In contrast, mobile banking demonstrated a positive and nearly significant effect, highlighting its

potential as a strategic Fintech tool. Point of Sale (POS) banking exhibited a positive but statistically insignificant impact, which may be attributed to deployment challenges or underutilization within the sector. Their study concluded that Fintech tools exert varying degrees of influence on the operational efficiency of Nigerian banks. The study advocates for the strategic need to strengthen mobile banking infrastructure and enhance customer awareness. Finally, their study suggested expanding POS infrastructure while improving transaction reliability and merchant training to optimize the effectiveness of digital payment channels.

Anoke (2022) in his study evaluated the impact of Information and Communication Technology (ICT) on the operational effectiveness of Quoted Deposit Money Banks (QDMBs) in Nigeria. Using a primary data approach, the research focused on a population of 19 QDMBs and through purposive sampling, three banks - Zenith Bank, GT Bank, and First Bank were selected based on a market valuation threshold exceeding ₦400 billion. The study further employed stratified and convenience sampling to select a sample of 164 respondents across these institutions. The empirical results revealed a significant positive relationship between ICT implementation and the operational effectiveness of Nigerian QDMBs, specifically regarding service quality and time efficiency. A fall back of this study is the limited scope of three banks and the use of convenience sampling in selecting respondents which could create some form of bias. The study also focuses on service quality and time delivery as measures of efficiency, leaving out the cost to income of these ICT channels. Rabiu et al (2019) studied the impact of electronic banking on the operational efficiency of Nigerian banks, using a case study of Diamond Bank Plc, Bauchi State Nigeria. The research adopted utilized primary data collected via questionnaires to analyze the relationship between digital banking (specifically mobile banking) and operational efficiency. The findings indicate that digital banking significantly enhances efficiency by enabling continuous account access, streamlining the online account opening process, facilitating immediate access to customer databases and eliminates traditional costs associated with cheque processing and postage. The gaps of this study include a very narrow population and sample by focusing on a single bank branch and examining efficiency from the customer perspective only. Hoehle et al. (2012) emphasized that digital banking research requires more diverse data sources, varied theoretical frameworks, and alternative methodologies to overcome fragmented findings and foster innovation. Their work highlights the persistent obstacles within the digital banking landscape, stressing that financial

institutions must prioritize continuous innovation and customer-centric service models to strengthen engagement and retention.

Methodology

The study adopted an ex post facto research design. The population of the study are the 24 money deposit banks listed in the stock exchange in Nigeria. Purposive and quota sampling techniques were used to select the deposit money banks as the sample size. The study sample adopts a balanced panel dataset comprising seven deposit money banks over a seven-year period (2018–2024), yielding 49 firm-year observations. The selected banks were chosen based on data availability and the period was selected owing to the rapid increase in digital banking after the pandemic. The logs of ATM, mobile banking POS and USSD variables were employed due to the large numerical values and to improve data normality and regression stability. The model applied in this study was adapted from Afolabi and Aribaba (2024), which is outlined as follows:

$OE = ß0 + ß1\ (IBt) + ß2\ (MBt) + ß3\ (PSt) + \varepsilon t.$

This study restates the model as;

$OEFit = \beta 0 + \beta 1ATMit + \beta 2POSit + \beta 3MOBit + \beta 3USSDit + \varepsilon it$

Where:

OEF = Operational Efficiency

ATM = ATM transaction representing ATM

POS = POS representing Agency banking

MOB = Mobile Banking

USSD = Unstructured Supplementary Service Data

B0 = Intercept

β1- β3 = Coefficients of the estimate

ε_{it} = Error term of the estimate for bank i at time t.

i = represents the individual firm (cross-sectional unit) in the sample.

t = time, indicating the specific time period.

Table I: Variables Measurement

Variable	*Measurement*	*Source*
Operational Efficiency (Dependent Variable)	Measured as cost to income ratio	Afolabi and Aribaba(2025)
Unstructured Supplementary Service Data (Independent Variable)	Measure as the total cost of the transaction carried out via USSD	Afolabi and Aribaba(2025)
Mobile Banking (Independent Variable)	Measure as the total number of registered mobile banking customers	Afolabi and Aribaba(2025)
Point of Sale (Independent Variable)	Measure as the total number of registered POS terminals	Afolabi and Aribaba(2025)
Automated Teller Machine (Independent Variable)	Volume of ATM transactions	Abdullai and Nyaoga (2017

Source: Researcher's Compilation (2026)

Data Presentation and Analysis

Table II: Descriptive Statistics

	Cost to Income Ratio	*ATM*	*Mobile Banking*	*POS*	*USSD*
Observations	49	49	49	49	49
Mean	56.7	3.22	6.44	4.46	6.84
STD	13.3	0.69	0.42	0.67	0.57
Minimum	21.2	2.23	5.02	2.92	5.32
Maximum	81.4	6.04	7.17	5.67	8.33

The descriptive statistics for the 49 observations reveal that the Cost to Income Ratio (CIR) across the selected Nigerian banks averages 56.7%, falling within a standard industry baseline but showing significant variation. This wide spread is highlighted by a high standard deviation of 13.3% and a broad range between the most efficient bank-year observation (21.2%) and the least

efficient (81.4%), which flags a substantial operational efficiency gap between aggressive digital adopters and cost-heavy institutions in the sample.

Among the digital transaction channels, USSD and Mobile Banking command the highest mean values of 6.84 and 6.44, confirming that mobile-first retail strategies represent the dominant transactional touchpoints for deposit money banks in Nigeria. Furthermore, all four digital infrastructure channels display very low standard deviations from 0.42 to 0.69.

Table III: Correlation Matrix

	Cost to Income Ratio	***ATM***	***Mobile Banking***	***POS***	***USSD***
Cost to Income Ratio	1.00	0.27	-0.06	-0.49	-0.03
ATM	0.27	1.00	-0.20	-0.11	-0.14
Mobile Banking	-0.06	-0.20	1.00	0.43	0.92
POS	-0.49	-0.11	0.43	1.00	0.42
USSD	-0.03	-0.14	0.92	0.42	1.00

The correlation matrix reveals that POS has the strongest negative association with the Cost to Income Ratio. Conversely, ATM display a positive correlation (r = 0.27) with the target variable. Both Mobile Banking (r = -0.06) and USSD (r = -0.03) show weak negative relationships with costs, moving in the direction of efficiency but at a much lower direct linear rate.

Table IV: Variance Inflation Factors

Variable	***VIF***	***Tolerance(1/VIF)***
USSD	7.15	0.139
Mobile Banking	7.38	0.135
POS	1.24	0.806
ATM	1.05	0.952

As shown in Table 4, all the independent /variables (USSD, Mobile Banking, POS, and ATM) yielded VIF indices safely below the conservative threshold of 10.0, with corresponding Tolerance

scores remaining above 0.10. The VIF values for POS (1.24) and ATM (1.05) are exceptionally low, showing near-complete independence. While USSD (7.15) and Mobile Banking (7.38) exhibit higher variance inflation.

Table V: Panel OLS Test

Dependent Variable: Cost to Income Ratio

Method: Panel OLS Estimation Summary				
Variable	**Coefficient**	**Standard Error**	**t-Statistics**	**p-Value**
Constant	86.4930	59.0190	1.4655	0.1510
ATM	7.1699	3.9697	1.8061	0.0788
Mobile Banking	-6.6921	11.7260	-0.5707	0.5715
POS	-11.9000	3.9333	-3.0254	0.0044
USSD	6.3364	8.5813	0.7384	0.4648
	R-Squared (Within)		0.4163	
	F-Statistic (Robust):		12.739 (p-value = 0.0000)	
	F-test for Poolability:		2.0510 (p-value = 0.0824)	
	Total Observations:		49	

The results presented in table evaluate the impact of digital banking channels (ATM, Mobile Banking, POS, and USSD) on the operational efficiency measured by the Cost to Income Ratio (CIR) of the selected deposit money banks in Nigeria.

The R-Squared (Within) value of 0.4163 indicates that approximately 41.63% of the total variations in the operational efficiency of the selected banks are explained by changes in the digital banking channels. The robust F-Statistic of 12.739 is accompanied by a p-value of 0.0000 ($p < 0.01$). Because this p-value is highly significant at the 1% level, we reject the null hypothesis that the model has no explanatory value. This confirms that all four digital banking variables collectively and simultaneously exert a statistically significant impact on the operational efficiency of deposit money banks in Nigeria.

Table VI: Hausman Test

Test Framework	*Chi-Square Statistic (χ2)*	*Degrees of Freedom (df)*	*P-Value*
Hausman Specification	19.804	4	0.0013

As displayed in Table 5, the Hausman specification test yielded a Chi-Square test statistic of 19.8041 with a corresponding p-value of 0.0013. Since the p-value is significantly lower than the standard critical threshold of 0.05, we reject the null hypothesis leading to the conclusion that the Fixed Effects (Panel OLS) model is the uniquely appropriate and robust estimator to interpret the empirical findings of this study.

Table VII: Heteroskedascity Test

LM Statistic:	***5.8168***
LM P-value:	**0.2133**
F-Statistic:	**1.4817**
F P-value:	**0.2240**

From the results in Table VII, we fail to reject the null hypothesis of homoskedasticity. There is no significant evidence of heteroskedasticity.

Table IX

Durbin-Watson Statistic:	***1.5790***

The Durbin-Watson statistic is within the acceptable range, suggesting no significant serial correlation in the residuals.

Table X

Jarque-Bera Test Statistic	*16.7862*
Jarque-Bera P-value:	0.0002
Skewness:	-1.1193
Kurtosis:	4.7917

With a P-value of 0.0002, which is significantly less than the conventional significance level of 0.05, we reject the null hypothesis. The skewness of -1.1193 indicates a left-skewed distribution,

and the kurtosis of 4.7917 (greater than 3) suggests a leptokurtic distribution (heavier tails and sharper peak than a normal distribution). We reject the null hypothesis of normality. The residuals are not normally distributed.

Table XI

Pesaran CD Test Statistic:	4.2982
Pesaran CD P-value:	0.0000

With a Pvalue of 0.0000, which is significantly less than the conventional significance level of 0. 05, we reject the null hypothesis. This indicates that the residuals are correlated across different p anels.

Interpretation of Results and Discussion of Findings

The findings of this study reveal that digital banking channels exert varying effects on the operational efficiency of deposit money banks in Nigeria. The overall model was statistically significant, indicating that ATM, Mobile Banking, POS, and USSD collectively explain a substantial proportion of the variations in the Cost-to-Income Ratio (CIR) of the sampled banks. This finding supports the Resource-Based View (RBV), which posits that technological resources can enhance organizational performance when effectively deployed and managed. However, the results further suggest that not all digital banking channels contribute equally to operational efficiency.

The study found that Point of Sale (POS) transactions have a negative and statistically significant effect on the Cost-to-Income Ratio, implying that increased POS activity improves operational efficiency by reducing operating costs relative to income generation. This finding is consistent with the study of Uchenna et al. (2025), who reported that agency banking, measured through POS systems, significantly enhanced the operational efficiency of deposit money banks in Nigeria. The similarity in findings may be attributed to the ability of POS channels to expand banking services beyond traditional branch networks at relatively low operational costs. The positive contribution of POS channels also aligns partially with the findings of Afolabi and Aribaba (2025), who reported a positive, though statistically insignificant, relationship between POS banking and operational efficiency. While both studies indicate that POS banking contributes positively to efficiency, the stronger significance observed in the present study may be explained by the rapid

expansion of agency banking networks and digital payment adoption in Nigeria during recent years.

Contrary to expectations, the study found that ATM transactions have a positive and marginally significant effect on the Cost-to-Income Ratio, suggesting that increased ATM activity is associated with lower operational efficiency. This result contrasts with the findings of Uchenna et al. (2025), who reported that ATMs significantly improved operational efficiency among Nigerian banks. The divergence may be explained by the changing economics of ATM operations in Nigeria. While ATMs initially reduced pressure on banking halls and improved customer convenience, banks currently face rising maintenance costs, cash replenishment expenses, network downtime challenges, energy costs, and security concerns associated with ATM infrastructure. These costs may outweigh the efficiency gains generated by ATM transactions, thereby increasing operating expenses and worsening the cost-to-income ratio. Furthermore, the growing preference for mobile and agent banking channels may have reduced the relative efficiency advantages traditionally associated with ATM deployment. The positive effect of ATM transactions on the Cost-to-Income Ratio can be explained by the rising operational costs associated with ATM deployment in Nigeria, including maintenance expenses, diesel and power supply costs due to unreliable electricity, and frequent system upgrades.

The findings regarding Mobile Banking reveal a negative but statistically insignificant relationship with operational efficiency. Although the direction of the coefficient suggests that mobile banking may contribute to improved efficiency, the effect was not strong enough to achieve statistical significance. This result partially agrees with Afolabi and Aribaba (2025), who found that mobile banking exerted a positive and nearly significant influence on operational efficiency. Both studies suggest that mobile banking possesses the potential to improve efficiency through reduced transaction costs and enhanced customer convenience. However, the insignificant result observed in the present study may indicate that the benefits of mobile banking have not yet translated into measurable reductions in operating costs for the sampled banks.

Similarly, USSD transactions were found to have a statistically insignificant effect on operational efficiency. Although USSD remains one of the most accessible digital banking channels in Nigeria, particularly among customers without smartphones or internet access, its impact on cost efficiency

appears limited within the study period. One possible explanation is that while USSD facilitates financial inclusion and transaction convenience, the associated service charges, telecommunications costs, revenue-sharing arrangements with network providers, and regulatory pricing constraints may reduce its overall contribution to operational efficiency. This finding suggests that the mere availability of digital channels does not automatically guarantee efficiency gains unless such channels are effectively integrated into the bank's broader operational strategy.

The findings of this study also support the conclusions of Anoke (2022), who established a significant positive relationship between Information and Communication Technology (ICT) adoption and the operational effectiveness of quoted deposit money banks in Nigeria. Although Anoke focused on service quality and time efficiency rather than cost efficiency, both studies underscore the importance of technological innovation in enhancing banking operations. The difference in the magnitude and significance of individual digital channels may be attributed to the different measures of efficiency adopted. While Anoke (2022) emphasized customer service outcomes, the present study employs the Cost-to-Income Ratio, which captures the financial efficiency implications of digital banking investments.

Overall, the study demonstrates that while digital banking remains an important driver of operational efficiency within Nigerian deposit money banks, the effectiveness of individual channels differs considerably. POS banking emerges as the most significant efficiency-enhancing channel, while ATM services appear to impose additional operational costs. Mobile banking and USSD, although promising, have yet to generate statistically significant efficiency improvements during the study period. These findings suggest that Nigerian banks should prioritize investments in digital channels that generate measurable cost savings while continually reviewing and optimizing the cost structures associated with ATM, mobile banking, and USSD operations.

Conclusion and Recommendation

This study examined the effects of Digital banking on Operational Efficiency among deposit money banks in Nigeria. The study conclusively establishes that Point of Sale (POS) infrastructure is a highly potent driver of corporate operational efficiency at the 1% significance level. Because POS transactions expand commission-based revenue streams without requiring heavy physical

branch footprints, they successfully compress the Cost to Income Ratio (CIR). Conversely, this study concludes that Automated Teller Machines (ATM) act as a marginal cost-driver rather than an efficiency optimizer ($p < 0.10$). Due to the severe structural overheads peculiar to the Nigerian operational environment—including high diesel energy costs, cash-in-transit security logistics, and relentless hardware maintenance—indiscriminate ATM expansion inadvertently inflates operating expenses. Finally, regarding Mobile Banking and USSD, the study concludes that while these retail channels dominate transactional frequency, they currently suffer from high parallel correlation, preventing them from exerting an independent, statistically verifiable impact on cost-to-income optimization.

The study recommends the following;

1. DMBs should aggressively expand POS and agent banking networks to lower the cost-to-income ratio, prioritizing them over costly brick-and-mortar branches.

2. Banks should cut ATM overheads by decommissioning unprofitable off-site kiosks and sharing infrastructure with other banks to reduce cash-handling costs.

3. Consolidate overlapping mobile and USSD platforms by migrating low-tier USSD users to lightweight mobile apps to achieve economies of scale.

4. The CBN should intervene in USSD pricing disputes between telcos and banks to reduce technological costs and protect financial inclusion efforts.

Future research studies can use this finding as a basis for further research on other benefits a DMB may derive from focusing on these outlets. They may also improve the study period to 10 to 15 years while also considering other relevant inputs like cybersecurity and other vulnerabilities.

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