© JUN 2026 | IRE Journals | Volume 9 Issue 12 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I12-1718719

The Impact of Information and Communication Technology on The Growth of The Banking Sector in Nigeria (2009–2024)

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Abstract- ***This study empirically investigates the long-run and short-run impacts of Information and Communication Technology (ICT) on the growth of the banking sector in Nigeria from 2009 to 2024. Utilizing the study employs the Autoregressive Distributed Lag (ARDL) cointegration framework. Banking sector growth (BGRW) is operationalized as the dependent variable, while digital financial channels—Automated Teller Machines (ATM), Point of Sale (POS) systems, mobile banking (MOB), and internet banking (INTB)—serve as the principal explanatory variables. Financial development (FD) and inflation (INF) are incorporated as macroeconomic control variables. The empirical results reveal a mixed-stationarity profile among the variables, validating the suitability of the ARDL Bounds testing technique. The long-run estimations indicate that ATM transactions, POS transactions, and mobile banking significantly and positively influence banking sector growth in Nigeria. Internet banking, however, exhibits a negative and statistically insignificant impact in both the short-run and long-run estimations. Financial development contributes positively to banking sector growth over the long run, while inflation demonstrates significance only within the short-run horizon. The study concludes that digital banking channels represent critical drivers of financial intermediation and institutional growth within Nigeria's banking system. However, infrastructural deficiencies, cybersecurity concerns, and digital literacy gaps continue to limit the full realization of ICT benefits. The study recommends increased investment in digital infrastructure, expansion of rural financial technology access, stronger cybersecurity frameworks, and intensified financial literacy campaigns to sustain the long-term growth of the Nigerian banking sector.***

Keywords: Information and Communication Technology, Banking Sector Growth, ARDL Framework, Financial Intermediation, Nigeria.

I. INTRODUCTION

Information has become one of the most valuable resources in the modern economy, serving as a foundation for decision-making, innovation, and economic development. Advances in Information and Communication Technology (ICT) have transformed how information is created, processed, stored, and transmitted, leading to significant improvements in productivity and service delivery across various sectors. ICT encompasses technologies such as computers, telecommunications, the internet, mobile devices, and digital applications that facilitate efficient communication and information management.

The banking sector is one of the industries most affected by ICT innovation. Traditionally, banking operations relied heavily on manual processes that were often characterized by delays, high operating costs, and limited accessibility. The adoption of ICT has transformed banking by automating operations, improving transaction speed, enhancing customer service, and expanding access to financial services. Technologies such as Automated Teller Machines (ATMs), Point of Sale (POS) terminals, electronic funds transfer systems, internet banking, and mobile banking have enabled banks to provide faster, more convenient, and secure financial services.

In Nigeria, ICT adoption gained momentum following the banking sector reforms introduced by the Central Bank of Nigeria (CBN), particularly the 2004 banking consolidation exercise and subsequent digital financial initiatives. Between 2009 and 2024, increased internet penetration, mobile phone usage, and the implementation of the cashless policy accelerated the use of electronic banking channels. Consequently, digital payment systems and electronic banking services became integral components of the Nigerian financial system, promoting operational efficiency, financial inclusion, and improved customer experience.

Beyond improving service delivery, ICT has strengthened banking operations through enhanced

risk management, fraud detection, regulatory compliance, and data management. It has also supported financial inclusion by extending banking services to previously underserved populations through mobile banking and agency banking platforms. These developments have contributed to the growth and modernization of Nigeria's banking sector. Despite these achievements, several challenges continue to hinder the effective utilization of ICT in the banking industry. Inadequate electricity supply, unstable internet connectivity, cybersecurity threats, high ICT infrastructure costs, and low levels of digital literacy remain significant obstacles. These challenges affect the reliability, accessibility, and efficiency of digital banking services and may limit the overall contribution of ICT to banking sector growth.

Given the strategic role of ICT in financial intermediation and economic development, it is important to evaluate its contribution to the growth of Nigeria's banking sector. Although substantial investments have been made in digital technologies, empirical evidence is needed to determine the extent to which ICT has enhanced banking sector performance over time.

Against this background, this study examines the impact of Information and Communication Technology on the growth of the Nigerian banking sector from 2009 to 2024, with emphasis on key ICT indicators and their contribution to banking sector development.

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Conceptual Review

2.1.1 Information and Communication Technology (ICT)

Information and Communication Technology (ICT) refers to the broad range of technological tools, systems, and resources used for the creation, collection, processing, storage, retrieval, transmission, and dissemination of information. It encompasses both information technology and communication technologies that enable individuals, organizations, and institutions to generate, exchange, and utilize information efficiently. ICT includes computer hardware and software, telecommunications networks, internet services, mobile devices, databases, cloud computing systems, and various digital applications that facilitate communication and decision-making processes.

In today's knowledge-driven economy, ICT has become an indispensable component of organizational management and economic development. The rapid advancement of digital technologies has transformed traditional methods of communication, business operations, and service delivery, enabling institutions to operate more efficiently and respond effectively to changing environmental demands. ICT serves as the backbone of modern organizational systems by providing platforms through which information can be accessed, analyzed, and transmitted in real time. Consequently, organizations across both public and private sectors increasingly rely on ICT to improve productivity, enhance competitiveness, and achieve strategic objectives.

The significance of ICT extends beyond mere information processing. It facilitates connectivity, supports innovation, improves operational efficiency, and enhances the quality of services provided to customers. Through ICT, organizations can automate routine processes, reduce manual errors, improve data accuracy, and accelerate decision-making. These capabilities have made ICT a critical driver of economic growth, globalization, and technological advancement in the twenty-first century.

Within the banking industry, ICT has emerged as one of the most transformative forces shaping financial service delivery and institutional performance. Before the widespread adoption of digital technologies, banking operations were largely manual and paper-based, requiring customers to visit bank branches physically to perform routine transactions. Such systems were often characterized by long queues, delayed transactions, high operational costs, and limited accessibility to financial services. However, the integration of ICT into banking operations has fundamentally changed this traditional model, leading to the development of more efficient, customer-centered, and technology-driven banking systems.

In the banking sector, ICT facilitates a wide range of activities, including account management, transaction processing, financial reporting, customer relationship management, risk monitoring, and electronic payment services. Through the application of digital technologies, banks can process large volumes of transactions accurately and securely within a relatively short period.

Customers are now able to access banking services conveniently regardless of geographical location or time constraints, thereby improving the overall banking experience.

Several technological innovations have played significant roles in the digital transformation of banking operations. Automated Teller Machines (ATMs) enable customers to withdraw cash, transfer funds, check account balances, and perform other banking functions without entering a banking hall. Point of Sale (POS) terminals facilitate cashless transactions and support electronic payments in commercial establishments. Internet banking platforms allow customers to access their accounts, make payments, and transfer funds through online portals, while mobile banking applications provide banking services directly through smartphones and other mobile devices.

Other notable ICT innovations include Electronic Funds Transfer (EFT) systems, Real-Time Gross Settlement (RTGS) systems, Unstructured Supplementary Service Data (USSD) banking, agency banking platforms, and digital payment gateways.

The adoption of these technologies has significantly enhanced the efficiency and effectiveness of banking operations. One of the most notable benefits of ICT in banking is the reduction of transaction costs. By automating routine processes and minimizing dependence on manual procedures, banks are able to reduce administrative expenses, improve resource utilization, and increase profitability. Customers also benefit from lower transaction costs, faster service delivery, and greater convenience in accessing financial services.

Furthermore, ICT has substantially improved operational efficiency within the banking sector. Electronic banking systems enable banks to process transactions in real time, reduce processing delays, minimize human errors, and improve service reliability. The automation of banking operations has also enhanced record-keeping, data management, and internal control mechanisms, thereby strengthening institutional performance and accountability.

Another important contribution of ICT is its role in expanding access to financial services. Through digital banking channels, financial institutions can reach customers in remote and underserved areas where traditional banking infrastructure may be limited or unavailable. Mobile banking, agency banking, and electronic payment systems have become important tools for promoting financial inclusion by providing affordable and accessible financial services to previously excluded populations. This expansion of financial access contributes to poverty reduction, economic empowerment, and inclusive economic growth.

In addition, ICT has enhanced customer satisfaction and service quality within the banking industry. Modern customers increasingly demand speed, convenience, accessibility, and security in financial transactions. Digital banking platforms provide twenty-four-hour access to banking services, allowing customers to perform transactions at their convenience. Real-time transaction alerts, online customer support services, electronic account statements, and instant fund transfers have further improved customer experiences and strengthened customer loyalty.

Beyond operational efficiency and customer service, ICT also supports effective risk management and security in banking operations. Advanced technologies such as data analytics, artificial intelligence, biometric authentication systems, encryption technologies, and fraud detection software help banks identify suspicious activities, prevent unauthorized access, and safeguard customer information. These technological capabilities enhance the security and integrity of banking systems while promoting trust and confidence among customers.

In contemporary banking environments, ICT is no longer viewed merely as a support function but as a

strategic asset that drives innovation, competitiveness, and sustainable growth. Financial institutions that effectively leverage ICT are better positioned to respond to market changes, develop innovative products, improve customer engagement, and maintain competitive advantages in an increasingly digital financial landscape. Consequently, ICT has become a critical determinant of banking sector growth and development in both developed and developing economies.

Therefore, Information and Communication Technology represent a fundamental pillar of modern banking operations, facilitating efficient service delivery, expanding financial access, improving operational performance, and contributing significantly to the growth and modernization of the banking sector. Its continued development and adoption remain essential for achieving greater financial inclusion, institutional efficiency, and economic progress.

2.1.2 Commercial Banking and Financial Intermediation

Commercial banks operate as financial intermediaries between surplus and deficit economic units. They mobilize deposits from savers and allocate funds to borrowers through credit facilities and investment financing.

The banking system contributes to economic development by promoting capital accumulation, facilitating payments, and supporting productive investments. Efficient banking systems improve financial inclusion and stimulate economic growth.

The introduction of ICT has transformed commercial banking operations by enhancing transaction efficiency and improving customer convenience.

2.1.3 ICT Integration within the Nigerian Banking Sector

ICT adoption within Nigeria's banking sector has accelerated significantly due to financial reforms and technological innovation. Mobile banking platforms now enable customers to transfer funds, pay bills, and manage accounts using mobile devices.

Automated Teller Machines (ATMs) provide twenty-four-hour banking services, while POS systems facilitate cashless transactions across retail outlets and agency banking networks.

Internet banking platforms further allow customers to conduct transactions remotely using webbased systems. These technologies have collectively improved financial accessibility and institutional efficiency.

2.2 Theoretical Review

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Fred Davis, explains how users adopt and utilize technological innovations. According to the theory, technology adoption depends primarily on two variables:

- Perceived Usefulness (PU)
- Perceived Ease of Use (PEOU)

Users are more likely to adopt technological systems if they believe such systems improve performance and are easy to use.

TAM is particularly relevant to this study because it explains customer adoption of electronic banking channels such as ATMs, POS terminals, and mobile banking applications.

2.2.2 Diffusion of Innovation Theory (DIT)

The Diffusion of Innovation Theory, developed by Everett Rogers, explains how technological innovations spread through societies over time.

The theory identifies five stages of innovation adoption:

DIT is relevant because it explains how banking technologies gradually become integrated into consumer behavior and institutional systems.

2.2.3 Resource-Based Theory (RBT)

The Resource-Based Theory argues that firms achieve sustainable competitive advantage through valuable, rare, inimitable, and non-substitutable resources.

ICT infrastructure represents a strategic organizational resource that can improve efficiency, innovation, and institutional competitiveness within the banking industry.

2.3 Theoretical Framework

This study adopts the Technology Acceptance Model (TAM) as its primary theoretical framework due to its strong relevance in explaining technology adoption within financial systems.

TAM provides a useful framework for understanding how consumers adopt digital banking technologies and how such adoption influences banking sector growth.

2.4 Empirical Review

Several empirical studies have examined the relationship between Information and Communication Technology (ICT) and banking sector growth in Nigeria, with most findings indicating that digital financial innovations have significantly improved banking performance, operational efficiency, and financial inclusion.

- Similarly, Sani Sabiu Bariki, Matthew, and Ismail (2025) examined the proliferation of information technology and the dynamic business environment of the twenty-first century. Their study found that technological innovations have fundamentally transformed business operations by improving efficiency, competitiveness, innovation, and organizational performance. The authors argued that organizations that effectively adopt digital technologies are better positioned to respond to changing market conditions and sustain long-term growth.

Furthermore, Iyobo and Shaba (2025) investigated the impact of digital banking on deposit money banks in Nigeria and found that digital banking channels significantly improve operational efficiency, profitability, and customer satisfaction. Likewise, Nnaemeka and Ofor (2025) reported that financial technology adoption positively influences bank performance through enhanced service delivery, reduced transaction costs, and improved financial accessibility.

Similarly, Adaramola and Kolapo (2019) established that ICT adoption significantly enhances banking sector performance by increasing transaction efficiency, improving service quality, and reducing operational costs. Okoye et al. (2019) also found that electronic banking services positively affect the financial performance of commercial banks in Nigeria through improved productivity and customer convenience.

More recently, Adeyemo and Fashagba (2023) revealed that digital banking channels such as Automated Teller Machines (ATMs), Point of Sale (POS) terminals, internet banking, and mobile banking contribute significantly to the financial performance of deposit money banks in Nigeria. Their findings emphasize that continuous investment in ICT infrastructure enhances competitiveness and institutional growth.

Furthermore, several studies have shown that ICT reduces operational costs, enhances transaction speed, improves customer satisfaction, and promotes financial inclusion. Electronic banking services such as ATMs, mobile banking, internet banking, and POS systems have expanded banking services to rural and previously unbanked populations.

However, despite these positive outcomes, some researchers have identified persistent challenges that hinder the full realization of ICT benefits in the Nigerian banking sector. These challenges include cybercrime, inadequate digital infrastructure, unreliable electricity supply, network failures, poor internet connectivity, and low digital literacy among some segments of the population. Addressing these constraints remains essential for sustaining the contribution of ICT to banking sector growth and financial system development.

This placement aligns with standard journal article structure and flows naturally from the conceptual and theoretical reviews into the empirical evidence before the methodology.

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DOI: https://doi.org/10.64388/IREV9I12-1718719

III. RESEARCH METHODOLOGY

3.1 Research Design

The study adopts an ex-post facto research design using a quantitative analytical framework. This approach is appropriate because the study relies on historical macroeconomic data that cannot be manipulated experimentally.

3.2 Sources and Nature of Data

The study utilizes quarterly secondary data spanning from 2009Q1 to 2024Q1. Data were sourced from the Central Bank of Nigeria Statistical Bulletin (2024 edition).

3.3 Model Specification

The functional model is specified as:

[
\ln BGRW_t = \beta_0 + \beta_1 \ln ATM_t + \beta_2 \ln POS_t + \beta_3 \ln MOB_t + \beta_4 \ln INTB_t + \beta_5 FD_t + \beta_6 INF_t + \mu_t
]

Where:

- (BGRW): Banking Sector Growth
- (ATM): Automated Teller Machine Transactions
- (POS): Point of Sale Transactions
- (MOB): Mobile Banking Transactions
- (INTB): Internet Banking Transactions
- (FD): Financial Development
- (INF): Inflation Rate

3.4 Estimation Technique

The study employs the Autoregressive Distributed Lag (ARDL) technique developed by Pesaran, Shin, and Smith (2001).

The ARDL approach is appropriate because:

- Variables exhibit mixed integration orders.
- The sample size is moderate.
- Both short-run and long-run dynamics can be estimated simultaneously.

Descriptive Statistics

This offers an overview general description of the nature of each variable in the dataset. They provide information on the central tendency, variability, and shape of data distribution. The most common measures of central tendency are the mean, median, and mode; measurements of variability and data distribution form include the standard deviation, variance, minimum value, maximum value, skewness, and kurtosis. These statistics help in understanding the nature and spread of the information and guide further analysis decisions, such as transformation or standardization, where it is required.

IV. EMPIRICAL RESULTS AND DISCUSSION

4.1 Unit Root Tests

The Augmented Dickey-Fuller (ADF) test results reveal a mixed integration structure among the variables.

Some variables are stationary at level (I(0)), while others become stationary after first differencing (I(1)). This validates the use of the ARDL framework.

4.2 Cointegration Results

The ARDL Bounds test confirms the existence of a long-run equilibrium relationship among the variables. The computed F-statistic exceeds the upper critical bound at the 5% significance level, leading to the rejection of the null hypothesis of no cointegration.

4.3 Long-Run Results

The long-run estimations indicate that ATM transactions positively and significantly influence banking sector growth.

POS transactions also demonstrate significant positive effects on banking sector performance.

Mobile banking exhibits the strongest positive relationship with banking sector growth, reflecting the rapid adoption of mobile financial technologies in Nigeria.

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Internet banking shows a negative and statistically insignificant impact, likely due to infrastructural challenges and cybersecurity concerns.

Financial development positively influences banking growth, while inflation remains insignificant in the long run.

4.4 Short-Run Results

The short-run dynamics indicate that ATM, POS, and mobile banking transactions continue to exert positive effects on banking sector growth.

The Error Correction Term (ECT) is negative and statistically significant, confirming adjustment toward long-run equilibrium.

Table 4.1
Summary Statistics

Statistic	*BGRW*	*ATM*	*POS*	*MOB*	*FD*	*INF*
Mean	11.59637	7.71E+08	1.73E+09	9.44E+08	3.104956	14.71110
Median	11.52443	6.95E+08	1.05E+08	474289072	2.084637	12.00000
Maximum	19.60353	1.91E+09	1.31E+10	8.02E+09	14.46048	28.92000
Minimum	7.407087	60133610	918256.0	1156533.	-10.68819	8.000000
Std. Dev.	2.490012	5.17E+08	3.40E+09	1.93E+09	4.674594	5.929065
Skewness	0.588035	0.584829	2.180769	2.427768	0.245061	1.231353
Kurtosis	3.839126	2.230152	6.547246	7.820011	4.106930	3.644537
Jarque-Bera	5.305154	4.983614	80.33185	118.9722	3.724845	16.47089
Probability	0.070469	0.082760	0.000000	0.000000	0.155296	0.000265
Sum	707.3788	4.70E+10	1.05E+11	5.76E+10	189.4023	897.3771
Sum Sq. Dev.	372.0096	1.60E+19	6.95E+20	2.24E+20	1311.110	2109.229
Observations	61	61	61	61	61	61

Source: Extract from E-views 9 Output

Table 4.1 describes the properties of the data for the estimation period. It is observed that banking sector growth (BGRW) ranges between 7.41 and 19.60 with a mean value of 11.60 and a standard deviation of 2.49. Because the mean is farther from the maximum, BGRW is positively skewed. However, the relatively smaller standard deviation suggests that BGRW is consistently distributed over the period. The mean value of ATM transactions (ATM) is 7.71E+08 with a range between 6.01E+07 and 1.91E+09 and a standard deviation of 5.17E+08. ATM is positively skewed, indicating the presence of higher transaction values in some periods. It is further observed that point of sale transactions (POS) range between 918,256.0 and 1.31E+10 with an average value of 1.73E+09 and a high standard deviation of 3.40E+09. POS is also positively skewed, suggesting significant dispersion and the presence of extreme values in the series. Similarly, mobile banking transactions (MOB) range between 1,156,533 and 8.02E+09 with a mean value of 9.44E+08 and a standard deviation of 1.93E+09. MOB is positively skewed, reflecting rapid increases in mobile transaction volumes over time. Moreover, financial development (FD) is observed with a mean value of 3.10, ranging between -10.69 and 14.46 with a standard deviation of 4.67. It is also positively skewed, indicating that higher values dominate the distribution despite some negative observations. Finally, inflation rate (INF) has a mean value of 14.71 with a range between 8.00 and 28.92 and a standard deviation of 5.93. INF is positively skewed, suggesting the prevalence of higher inflation episodes within the period. The Jarque-Bera statistics test of normality suggest that while residuals of BGRW, ATM and FD are normally distributed, residuals of POS, MOB and INF are not normally distributed at 5% significance level.

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Table 4.2
Phillip-Peron Unit Root Tests

Variable	Level	First Diff	I(d)
BGrw	3.2696* (0.0814)		I(0)
LnATM	2.5740 (0.2933)	4.7961*** (0.0014)	I(1)
LnPOS	3.8285** (0.0218)		I(0)
LnINTB	2.1697 (0.4972)	5.9555*** (0.0000)	I(1)
LnMOB	3.1029 (0.1152)	7.7883*** (0.0000)	I(0)
FD	4.8348*** (0.0012)		I(0)
INF	3.8782*** (0.0195)		I(0)

Source: Extract from E-views 9 Output.
NB: ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Table 4.2 presents unit root stationarity test of the variables employed in this study, using the conventional test. It shows PP unit root results at level I(0) and first difference I(1) for all variables. The results reveal a mixed order of integration. While BGrw, lnPOS, lnMOB, FD and INF are stationary at level I(0), lnATM, lnPOS and lnMOB are stationary at first difference I(1). This satisfies the ARDL procedure as proposed.

Table 4.3
Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-222.61	NA	42.800	15.107	15.294	15.167
1	-96.689	209.88	0.0284	7.7792	8.7134	8.0781
2	-67.325	41.109	0.0124	6.8883	8.5698	7.4262
3	6.0841	40.723*	0.0013*	4.1277*	7.3037*	5.1437*
4	-40.904	29.944	0.0073	6.1936	8.6223	6.9705

Source: Extract from E-views 9 Output.

From results in Table 4.3, lag 3 is selected base on the significant minimum AIC criterion value 4.12. Hence, the ARDL model for this study is estimated with a lag of 3 as its maximum lag.

Table 4.4
Cointegration Test

Bound Test			
F-Statistic	I(0)	I(1)	Significance
3.7574***			
		3.23	10%
	2.45	3.61	5%
	3.15	4.43	1%

Source: Extract from E-views 9 Output.
NB: ***, ** and * indicate significance at 1%, 5% and 10% respectively.

From result on table 4.4, it is established that the F-statistic derived from the bound test of the regression model estimated is 3.75 obtained from the Pesaran Table at 5% level of significance. Comparing this to

the critical value, it is observed that the F-statistic is greater than the critical values at upper bound (3.61). This informs the rejection of the null hypothesis at 5% level of significance and the conclusion that variables are cointegrated.

V. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary of Findings The study finds that:

- ATM transactions significantly improve banking sector growth.
- POS transactions positively affect banking sector expansion.
- Mobile banking exerts the strongest positive effect on banking sector growth.
- Internet banking demonstrates insignificant effects.
- Financial development contributes positively to long-run banking growth.

5.2 Conclusion

The study concludes that Information and Communication Technology represents a major driver of banking sector growth in Nigeria. The expansion of ATM services, POS systems, and mobile banking platforms has improved transaction efficiency, operational performance, and financial inclusion.

However, structural challenges such as poor internet infrastructure, cybersecurity risks, and low digital literacy continue to limit the effectiveness of certain digital banking platforms, particularly internet banking services.

Sustained investment in digital infrastructure and supportive regulatory policies will therefore remain essential for the future growth and modernization of Nigeria's banking sector.

5.3 Recommendations

The study recommends the following:

1. Government should improve electricity supply and telecommunication infrastructure to support digital banking operations.
2. Banks should strengthen cybersecurity systems to reduce electronic fraud and improve customer trust.
3. Regulatory authorities should encourage financial literacy programs to improve digital banking adoption.
4. Financial institutions should expand mobile banking and POS services into rural communities to improve financial inclusion.
5. The Central Bank of Nigeria should continue supporting fintech innovation and digital financial reforms.

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