BRIDGING THE FINANCIAL DIVIDE: THE IMPACT OF DIGITAL FINANCE IN NIGERIA

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ABSTRACT

The study aims to investigate the impact of digital financial technology in bridging the financial inclusion gap between 2011 and 2022. Specifically, the study examined how digital financial technologies such as internet banking, point of sale terminals, and automated teller machines have facilitated access to appropriate and affordable financial services, such as savings, loans, insurance, and payments, for all segments of Nigerian society. By utilizing secondary data from the Central Bank of Nigeria and the Nigeria Inter-Bank Settlement System (NIBSS), the study employs descriptive and econometric techniques to analyze the impact of these digital financial services (DFS) channels on financial inclusion. The findings suggest that while point of sale (POS) terminals have a significant positive impact on financial inclusion, the influence of automated teller machines (ATMs) and internet banking is less pronounced. The government, in collaboration with network providers, should invest in improving network infrastructure to support the widespread adoption of internet banking. Banks should complement these efforts by conducting educational campaigns to familiarize customers with digital banking services. Policymakers should also prioritize strategies to expand the availability of Automated Teller Machines (ATMs) in both urban and rural areas. Additionally, improvements in network connectivity and the ATM's capacity to dispense cash are essential. Policymakers can leverage these insights to develop targeted policies that promote the growth of these financial services, particularly in areas where access is limited.

Keywords*: Digital Finance, Financial Inclusion, Nigeria, Central Bank*

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1. INTRODUCTION

Digital finance and financial inclusion have emerged as critical global development priorities. Since 2008, the World Bank has emphasized the importance of financial inclusion as a key driver of poverty alleviation, shifting focus from microfinance to a broader financial inclusion agenda. This shift has accelerated the development of financial inclusion initiatives globally (Gabor and Brooks, 2017). Recognizing that poverty stems from unequal income distribution rather than a scarcity of resources, efforts to promote inclusiveness, such as financial inclusion, have gained significant traction in research and policy.

Inclusive finance, which entails providing appropriate and affordable financial services to all segments of society, has achieved significant developmental outcomes since its inception in 2005 by the United Nations. The third plenary session of the 18th Central Committee in 2013 explicitly advocated for the development of inclusive finance. Subsequently, in late 2015, the State Council issued the "Plan for Promoting the Development of Inclusive Finance (2016-2020)" (hereinafter referred to as the "Plan"), solidifying inclusive finance as a crucial national development strategy. Digital inclusive finance, a novel financial service model, lowers the barriers to entry for financial services, reduces transaction costs, expands financial service coverage, and enhances efficiency. This innovative approach offers promising opportunities to alleviate financing constraints for small and medium-sized enterprises (SMEs) (Huang and Huang, 2018).

The Nigerian government, in collaboration with the Central Bank of Nigeria, has prioritized financial inclusion and stability as essential pillars of sustainable and inclusive growth. To achieve this, policies have been implemented to broaden access to affordable financial services, particularly for marginalized and vulnerable groups. These initiatives aim to reduce financial exclusion and integrate a larger portion of the population into the formal economy. Technological advancements have been leveraged to support these efforts and enhance financial accessibility.

Financial technology, or fintech, leverages digital technology to revolutionize financial services. As Ozili (2018) noted, it encompasses a wide array of products, services, and technology that enable individuals and businesses to access payment, savings, and credit facilities online, bypassing traditional physical banking. Fintech employs innovative technologies to disrupt traditional financial practices, automating and enhancing the delivery of financial services. By removing barriers to banking services and promoting their usage, fintech is expected to contribute significantly to national economic growth, as highlighted by the Asian Development Bank (2016). The growing recognition of financial inclusion as a vital economic component has spurred global efforts to reduce or eliminate barriers to formal banking services. Researchers have increasingly focused on the role of financial technology in facilitating financial inclusion and stability, particularly in emerging economies.

Makina and Fanta (2019) found that technology has enhanced both the accessibility and usage of financial services, thereby improving financial inclusion and stability.

Their study specifically highlighted the positive impact of internet access and ATMs. Similarly, Radcliffe and Voorhies (2012) noted that financial technology has expanded digital payment platforms, connecting underserved individuals with savings, credit, and insurance providers. According to the World Bank (2020), technology-based interventions require reliable and efficient infrastructure to ensure user-friendly, secure, and cost-effective services. Many developing economies, including Nigeria, lack such robust infrastructure, which may limit citizen participation.

Despite the growing body of literature on digital financial technology and financial inclusion, several research gaps remain, particularly in the context of developing economies like Nigeria. While studies such as Makina and Fanta (2019) and Radcliffe and Voorhies (2012) have highlighted the positive impact of digital financial technologies on financial inclusion, most research tends to focus on isolated channels of digital finance, such as mobile banking, ATMs, or internet banking, without examining their combined impact. For instance, Ehiedu et al. (2022) and Anyawu and Anumaka (2020) have explored the role of ATMs and POS systems, respectively, but there is limited research on how these technologies interact to drive financial inclusion. This fragmented approach limits the understanding of the holistic impact of digital financial services on financial inclusion.

Furthermore, while studies like Lakhouil and Segdali (2024) and Mutale and Shumba (2024) have demonstrated the positive correlation between digital finance and financial inclusion, there is a lack of research on the context-specific challenges that hinder the adoption of digital financial technologies in developing countries. For example, issues such as poor internet infrastructure, low financial literacy, and cultural barriers are often overlooked, despite their significant impact on the effectiveness of digital financial services. Additionally, while Yang (2024) and Sun and Zhang (2024) have explored the role of digital finance in enhancing financial market efficiency and MSME innovation, there is limited research on the emerging risks associated with digital finance, such as cybersecurity threats and data privacy concerns, particularly in the Nigerian context.

Another critical gap is the lack of longitudinal studies that examine the sustained impact of digital financial technologies on financial inclusion over time. Most studies, such as Bayar et al. (2021) and Risman et al. (2021), rely on cross-sectional data, which limits the ability to assess the long-term effects of digital finance on economic growth, poverty reduction, and income inequality. Moreover, while Ene et al. (2019) and Mago and Chitokwindo (2014) have highlighted the role of digital banking and mobile banking in promoting financial inclusion, there is a need for more primary data-driven research that captures the perceptions, attitudes, and behaviors of users, particularly in rural and underserved areas.

This study aims to address these gaps by examining the combined impact of multiple digital financial channels—such as internet banking, POS terminals, and

ATMs—on financial inclusion in Nigeria. By incorporating context-specific factors and leveraging longitudinal data, the study seeks to provide a more nuanced understanding of the role of digital financial technologies in bridging the financial inclusion gap.

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical Review

2.1.1 Theory of Consumption Value (TCV)

The theory offers insights into consumer decision-making processes when selecting products or services (Sheth et al., 1991). It provides a theoretical framework for understanding the adoption of payment technologies, as modern payment systems extend beyond cash transactions to encompass consumer attitudes and perceptions of various payment options.

Within the context of payment technology, TCV highlights four key dimensions of consumption value:

- Functional value: Rooted in economic utility theory, this dimension emphasizes rational decision-making based on product or service attributes like performance, price, quality, and reliability.
- Social value: This dimension considers the social significance and symbolic meaning associated with products or services. Consumers may choose a particular option not only for its functionality but also for the social status or image it conveys.

For example, using an ATM card for payments or carrying a stack of banknotes.

- Emotional value: This dimension explores how products or services elicit emotional responses in consumers, both positive and negative. Emotional value is tied to the feelings a customer associates with a product or service. In the realm of payments, the "pain of paying" is an emotional response linked to the transparency of the payment process.
- Conditional value: This dimension highlights how the value of a product or service can be influenced by specific contextual factors, such as location or time. The choice of payment method may be affected by factors like the physical location of the transaction (e.g., street, store, or online) or the timing of the payment (e.g., end of the month when salaries are paid or mid-month).

The Theory of Consumption Value (TCV), introduced by Sheth et al. in 1991, has evolved significantly over the years, particularly in the context of digital financial technologies and financial inclusion. The theory's four dimensions—functional value, social value, emotional value, and conditional value—have been widely applied to understand consumer behavior in adopting payment technologies and digital financial services. Since its introduction, TCV has been applied across various domains, including technology adoption, e-commerce, and financial

services. In the context of digital financial technologies, the theory has been particularly useful in explaining how consumers perceive and adopt new payment systems. Empirical studies have expanded the application of TCV to include: functional value in digital financial services: Recent studies (Yang, 2024; Sun and Zhang, 2024) have highlighted the importance of functional value in driving the adoption of digital financial services. For example, mobile money services are often adopted because they offer cost-effectiveness, speed, and accessibility, especially in underserved areas. The functional value of digital financial services has been a key driver of financial inclusion, particularly in developing countries like Nigeria.

Social value and digital payments: The social value of digital financial services has gained prominence in recent years. For instance, using mobile banking apps or digital wallets is often associated with modernity and financial empowerment. Studies (Lakhouil and Segdali, 2024) have shown that social influence and peer behavior play a significant role in the adoption of digital financial services, particularly among younger and tech-savvy populations. Emotional value and user experience: Emotional value has become increasingly relevant in the digital age, where user experience is a critical factor in technology adoption. Research (Khatoon and Ahmed, 2020) has shown that the ease of use and emotional satisfaction derived from using digital financial services significantly influence adoption. For example, the "pain of paying" is minimized in digital transactions, making them more appealing to users.

Conditional value and contextual factors: Conditional value has been explored in the context of geographical location, timing, and socioeconomic factors. For instance, rural populations may prefer mobile money services due to limited access to physical banks, while urban users may prioritize internet banking for its convenience (Ehiedu et al., 2022). Conditional value highlights the importance of tailoring digital financial services to meet the specific needs of different user groups.

2.1.2 Diffusion of Innovation Theory (DOI)

The Diffusion of Innovation Theory (DOI), introduced by Rogers (2015), complements TCV by providing a framework for understanding how digital financial technologies spread among different user groups. The integration of TCV and DOI offers a comprehensive perspective on the adoption of digital financial services:

- Relative advantage and functional value: The relative advantage of digital financial services, as emphasized by DOI, aligns with the functional value dimension of TCV. For example, mobile money services offer clear advantages over traditional banking methods, such as lower transaction costs and greater accessibility, which drive their adoption.
- Compatibility and social value: The compatibility of digital financial services with users' existing values and practices, as highlighted by DOI,

resonates with the social value dimension of TCV. For instance, digital payment systems that align with cultural norms and social practices are more likely to be adopted.

- Complexity and emotional value: The complexity of digital financial services, as discussed in DOI, relates to the emotional value dimension of TCV. Services that are easy to use and provide a positive user experience are more likely to be adopted, as they minimize the "pain of paying" and enhance emotional satisfaction.
- Trialability and conditional value: The trialability of digital financial services, as emphasized by DOI, connects with the conditional value dimension of TCV. For example, allowing users to test mobile money services without commitment can increase adoption, particularly in contexts where trust in digital technologies is low.

Recent empirical studies have provided valuable insights into the adoption of digital financial technologies, further bridging TCV and DOI: Adoption in Developing Countries: Studies (Mutale and Shumba, 2024; Bayar et al., 2021) have shown that the adoption of digital financial services in developing countries is influenced by a combination of functional value (e.g., affordability and accessibility), social value (e.g., peer influence), and conditional value (e.g., geographical and socioeconomic factors). These findings align with both TCV and DOI, highlighting the importance of addressing multiple dimensions of value and innovation attributes to promote financial inclusion. Role of technology acceptance: The Technology Acceptance Model (TAM), which is built on TCV and DOI, has been widely used to explain the adoption of digital financial services. For example, studies (e.g., Lule et al., 2012; Mojtahed et al., 2011) have shown that perceived ease of use and perceived usefulness are critical factors in the adoption of mobile banking and digital payment systems. These findings reinforce the relevance of TCV and DOI in understanding technology adoption.

Emerging technologies: The rise of blockchain, artificial intelligence (AI), and big data analytics has introduced new dimensions to TCV and DOI. For instance, blockchain-based financial services offer enhanced security and transparency, which increases their functional and emotional value. Similarly, AI-driven financial platforms provide personalized services, enhancing their compatibility and relative advantage (Sun and Zhang, 2024). The Theory of Consumption Value (TCV) and the Diffusion of Innovation Theory (DOI) provide a robust theoretical foundation for understanding the adoption of digital financial technologies and their impact on financial inclusion. TCV explains the value individuals derive from digital financial services, while DOI explains the process by which these services spread among different user groups. Together, these theories offer a comprehensive framework for analyzing the factors that influence the adoption of digital financial technologies, particularly in developing countries like Nigeria. The next theory, the Technology Acceptance Model (TAM), builds on TCV and DOI by focusing on users' perceptions of digital financial services. TAM emphasizes the role of perceived ease of use and perceived usefulness in driving technology adoption, providing further

insights into the behavioral and psychological factors that influence financial inclusion. By integrating TCV, DOI, and TAM, the study can offer a holistic understanding of how digital financial technologies can bridge the financial inclusion gap.

2.1.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), originally proposed by (Davis, 1986), aims to explain why individuals choose to adopt or reject new technologies (Monyoncho, 2015). TAM focuses on perceptions rather than actual usage, suggesting that users' decisions are influenced by two primary factors: Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) (Lule et al., 2012). PEOU reflects users' confidence in their ability to use a technology effectively, while PU refers to the extent to which users believe the technology will be beneficial to them in the short and long term (Mojtahed et al., 2011). TAM posits that users' behavioral intentions to use a technology are directly influenced by their perceptions of its ease of use and usefulness.

The theory emphasizes that users' perceptions of a new technology are closely tied to its functionality and user-friendliness (Muiruri and Ngari, 2014). It also highlights the significant role of consumer intentions and perceptions in the adoption of new technologies (Mojtahed et al., 2011). Moreover, TAM explores individuals' attitudes towards specific systems, providing insights into why people choose to adopt or reject technological advancements (Lule et al., 2012). TAM is not only a predictive model but also a useful tool for assessing the likelihood of individuals and organizations adopting specific technologies (Mojtahed et al., 2011). It can be applied to explain the usage behavior of digital financial services and the variations in consumer behavior related to such services (Muiruri and Ngari, 2014). The Technology Acceptance Model (TAM) is a more suitable theoretical framework for this study. It provides a framework for understanding how users' perceptions of digital financial technologies influence their adoption and, consequently, financial inclusion

The three theories—TCV, DOI, and TAM—complement each other in explaining the adoption and impact of digital financial technologies on financial inclusion: TCV explains the value individuals derive from digital financial services, which drives their adoption. DOI explains the process by which digital financial services spread among different user groups and the factors that influence their adoption. TAM explains how users' perceptions of digital financial services influence their willingness to adopt them. These theories provide a comprehensive framework for understanding how digital financial technologies can bridge the financial inclusion gap by addressing the needs, perceptions, and behaviors of potential users. This aligns with the study's objective of examining the effects of digital financial technology in bridging the financial inclusion gap in Nigeria.

2.2 Empirical Review

Damayanthi (2024) in her study reviewed existing literature on financial inclusion (FI) to understand its importance for a country's growth. The study identified key barriers, such as limited income, access issues, and lack of financial knowledge as barriers to financial inclusion (FI). The study finds that FI contributes significantly to economic growth by creating jobs, reducing inequality, and stabilizing the financial system. Lakhouil and Segdali (2024) employed a quantitative approach to assess the impact of digital finance on financial inclusion in Morocco. Utilizing data from 454 individual bank customers and structural equation modeling, the research investigates the correlation between digital finance and factors such as access, quality, usage, and financial well-being. The findings reveal a significant positive impact of digital finance on these dimensions, thereby promoting individual financial inclusion.

Mutale and Shumba (2024) in their study employed a cointegration analysis to examine the relationship between digital finance and financial inclusion in Zimbabwe over the period 2000-2020. The study findings suggest a positive correlation between digital finance proxies, including ATMs, GDP, broad money, and remittances, and financial inclusion. A unit increase in digital financial innovations was found to correspond to approximately a 3.116906 unit increase in financial inclusion. Furthermore, the study distinguished between traditional and innovative digital payment methods, concluding that innovative methods contribute more significantly to financial inclusion.

Yang (2024) examined the significant role of digital finance and financial inclusion in modern financial systems. The study reviewed the evolution of these concepts in the 21st century and summarized their positive impacts on small, micro-enterprises, and individual consumers. The paper highlighted the significance of digital finance in enhancing the efficiency of financial markets by improving information asymmetry and facilitating better matching between borrowers and lenders. Additionally, it emphasized the potential of digital finance to improve consumer welfare through increased access to financial services and products.

Sun and Zhang (2024) investigated the impact of digital inclusive finance on the technological innovation of micro, small, and medium-sized enterprises (MSMEs) in China. By combining the Peking University Digital Financial Inclusion Index with MSME innovation data, the study confirms a positive correlation between the development of digital financial inclusion and MSME technological innovation. Findings from the study also suggest that digital inclusive finance positively affects the innovation of enterprises across different technological levels. Additionally, the analysis revealed regional disparities in the impact of digital financial inclusion, with central and western regions demonstrating stronger effects than the eastern region.

Ehiedu et al. (2022) examined the correlation between ATM penetration and financial inclusion in Nigeria between 1990 and 2019. Employing econometric analysis, their findings indicate a positive relationship between ATM penetration

and financial inclusion levels. Although overall ATM penetration remains limited, demographic ATM penetration appears substantial. The study concludes that demographic ATM penetration is instrumental in fostering financial inclusion in Nigeria. Bayar et al. (2021) examined the influence of mobile phone and internet usage on financial inclusion in eleven post-communist countries between 1996 and 2017. Employing panel co-integration and causality tests, their research revealed a positive, albeit modest, impact of mobile phone and internet development on financial inclusion and stability. This effect is significant for financial development, poverty reduction, and mitigating income inequality in post-communist EU countries.

Similarly, Risman et al. (2021) investigated the influence of digital finance on financial stability, emphasizing the role of risk factors in digital financial relationships and financial stability, particularly systemic risk. Using univariate linear regression and moderating regression analysis, they concluded that digital finance positively impacts financial stability.

Likewise, Khatoon and Ahmed (2020) conducted a panel study on the impact of internet connectivity on financial inclusion in Asian and African countries. Employing the Gaussian Mixture Model (GMM) econometric technique, they found a positive correlation between the financial inclusion index and internet users. Additionally, they discovered a significant positive relationship between economic growth and financial inclusion.

Anyawu and Anumaka (2020) conducted a study on the impact of Point of Sale (POS) on the cashless policy in the Nigerian economy. They collected primary data and utilized econometric tools such as co-integrated least square method, autoregressive lag, residual graph, cointegrations, and unit root analysis to analyze the data. The study concluded that POS has a strong and positive impact on the implementation of the cashless policy in Nigeria. Similarly, Ene et al. (2019) examined the impact of digital banking on financial inclusion in the context of the Central Bank of Nigeria's cashless policy. Using correlation and ex-post facto research designs and computer-based multiple regression analysis over a ten-year period from 2008 to 2017, the study revealed a substantial impact of digital banking on financial inclusion. The point of sale was identified as a key driver of financial inclusion in Nigeria.

Mago and Chitokwindo (2014) investigated the impact of financial technology, specifically mobile banking, on financial inclusion in Zimbabwe's Masvingo province. Using a qualitative research methodology and survey design, they found that electronic banking significantly influences financial inclusion. Notably, their study indicated that low-income individuals are more likely to adopt mobile banking, thereby promoting financial inclusion.

The research theme bridging the financial divide: the impact of digital finance in has evolved significantly, driven by both theoretical advancements and empirical findings. The integration of Theory of Consumption Value (TCV), Diffusion of Innovation Theory (DOI), and Technology Acceptance Model (TAM) provides a

robust theoretical foundation for understanding the adoption and impact of digital financial technologies. Empirically, studies such as those by Lakhouil and Segdali (2024), Mutale and Shumba (2024), and Yang (2024) have demonstrated the transformative potential of digital finance in promoting financial inclusion, particularly in developing economies. These studies highlight the importance of functional value, social value, and conditional value in driving the adoption of digital financial services, as well as the role of relative advantage, compatibility, and perceived ease of use in facilitating their spread.

The empirical findings reveal that digital financial technologies, such as mobile banking, point-of-sale (POS) systems, and automated teller machines (ATMs), have significantly improved access to financial services, particularly for underserved populations. For instance, Ehiedu et al. (2022) found that ATM penetration positively correlates with financial inclusion in Nigeria, while Bayar et al. (2021) demonstrated the impact of mobile phone and internet usage on financial inclusion in post-communist countries. These findings underscore the importance of addressing infrastructure gaps, user perceptions, and contextual factors to enhance the adoption and effectiveness of digital financial services. Moreover, the research highlights the competitive advantage of digital financial technologies in modern economies. By improving efficiency, transparency, and accessibility, digital finance enhances the competitiveness of financial systems, particularly in developing countries. For example, Sun and Zhang (2024) found that digital inclusive finance positively impacts the technological innovation of micro, small, and medium-sized enterprises (MSMEs), driving economic growth and reducing regional disparities. Similarly, Risman et al. (2021) emphasized the role of digital finance in promoting financial stability, which is critical for sustainable economic development.

The integration of theoretical and empirical insights provides a comprehensive framework for understanding the interconnectedness of digital financial technology and financial inclusion. By addressing the value dimensions of TCV, the innovation attributes of DOI, and the user perceptions of TAM, policymakers and practitioners can design more effective strategies to promote financial inclusion. Furthermore, the research highlights the need for continuous innovation in digital financial technologies, particularly in addressing emerging risks and leveraging emerging technologies such as blockchain and artificial intelligence (AI). This interconnected approach not only enhances the theoretical understanding of digital finance but also provides practical insights for achieving modern competitive advantage in the global financial ecosystem.

The research theme of digital financial technology and financial inclusion is deeply interconnected with the modern competitive advantage of economies, particularly in the context of globalization and technological advancement. Digital financial technologies, such as mobile money, digital wallets, and blockchain-based platforms, have emerged as key drivers of economic competitiveness by enhancing financial access, efficiency, and innovation. For instance, Yang (2024) highlighted the role of digital finance in improving information asymmetry and facilitating better matching between borrowers and lenders, which enhances the efficiency of

financial markets. Similarly, Sun and Zhang (2024) demonstrated how digital inclusive finance fosters technological innovation among MSMEs, contributing to regional economic development and reducing disparities.

The competitive advantage of digital financial technologies lies in their ability to leverage technology to address longstanding challenges in financial inclusion, such as high transaction costs, limited access to banking services, and informal financial systems. By providing affordable, accessible, and user-friendly financial solutions, digital finance empowers individuals and businesses, particularly in underserved areas, to participate in the formal economy. This not only promotes economic growth but also enhances social welfare by reducing poverty and inequality.

Moreover, the integration of emerging technologies, such as AI, big data analytics, and blockchain, further enhances the competitive advantage of digital financial services. For example, AI-driven financial platforms can provide personalized services and predictive analytics, improving user experience and decision-making. Blockchain technology, on the other hand, offers enhanced security and transparency, addressing concerns related to fraud and trust in digital transactions. These innovations not only strengthen the resilience of financial systems but also position economies to compete effectively in the digital age. In conclusion, the theoretical and empirical innovations in the research theme of digital financial technology and financial inclusion provide a comprehensive understanding of the factors driving the adoption and impact of digital financial services. By addressing the value dimensions, innovation attributes, and user perceptions of digital finance, the research offers practical insights for achieving modern competitive advantage in the global financial ecosystem. This interconnected approach underscores the transformative potential of digital financial technologies in promoting financial inclusion, economic growth, and sustainable development.

3. METHODOLOGY

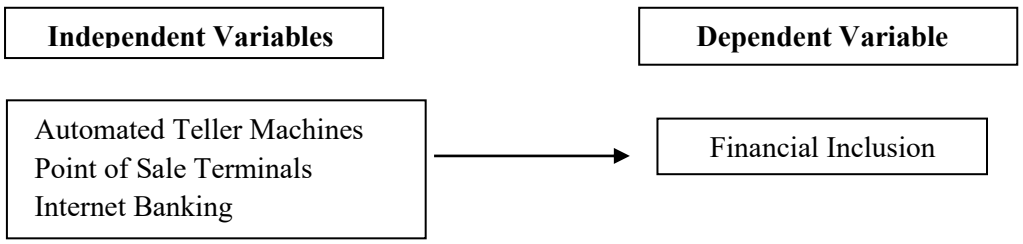

Figure 1: Conceptual Framework

Based on the literature review, the following hypotheses are formulated:

H_1: Internet banking has no effect on financial inclusion and stability in Nigeria.

H_2: Automated Teller Machines has no effect on financial inclusion and stability in Nigeria.

H_3: Point of Sales has no effect on financial inclusion and stability in Nigeria.

3.2. Operationalization

Table 1: Indicators and Measures for Variables

Variables	Indicators	Measures
Digital Financial Technology	Automated Teller Machines (ATMs)	Volumes of ATM transaction
	Internet Banking (IB)	Volumes of IB transaction
	Point of Sales (POS)	Volumes of POS transaction
Financial Inclusion	Numbers of bankable population (FIS)	Percentage of bankable populace with access to formal sector financial systems, products, and services.

The model for this study is the modified versions based on the work of Ogbeide (2019) and Ene et al. (2019). Both studies used the volume of ATM, POS, and internet banking transactions as independent variables to assess their impact in bridging the financial inclusion gap. While Ogbeide (2019) focused on these variables, Ene et al. (2019) employed a broader approach, using the number of bankable populaces with access to formal sector financial systems, products, and services as the proxy variable sourced from the Central Bank of Nigeria Bulletin as financial inclusion (dependent variable).

3.2 Research design

A descriptive research design is adopted in this study to analyze the impact of digital finance in bridging the financial divide in Nigeria.

3.3 Population and sample size

The population in this study are all relevant financial technology variables related to internet banking, ATMs, and POS terminals within the Nigerian financial system. The selected sample size of the study consists of three selected financial technology variables internet banking, ATM and POS for a period of 11 years for each of the

selected variables. The study did not focus on specific regions in the Nigeria and date sourced were quantitative and secondary sourced from the Central Bank of Nigeria and the Nigeria Inter-Bank Settlement System (NIBSS).

3.4 Data analysis

The analysis of the data involved the application of various analytical techniques to fulfill the research objectives. The research objectives of this study focus on how digital finance can bridge the financial inclusion gap in Nigeria. The study data were analyzed using descriptive statistics and Ordinary Least Squares (OLS) regression, a technique that produces the Best Linear Unbiased Estimate (BLUE).

3.5 Model specification

This study utilized a time-series dataset spanning eleven years (2011-2022) sourced from reputable institutions such as the Central Bank of Nigeria and the Nigeria Inter-Bank Settlement System (NIBSS). The research focused on the impact of key financial technology variables, including internet banking, automated teller machines (ATMs), and point-of-sale (POS) terminals, on financial inclusion in Nigeria. The extracted data were analyzed using descriptive statistics and Ordinary Least Squares (OLS) regression, a technique that produces the Best Linear Unbiased Estimate (BLUE).

The model assessed the impact of digital finance, specifically focusing on internet banking (IB), point-of-sale (POS) terminals, and automated teller machines (ATMs), as proxies for digital finance. These technologies were selected due to their widespread adoption and significant influence on global financial transactions. They represent tangible elements of digital financial infrastructure, facilitating access to banking services in both urban and rural areas.

While mobile money transactions could also serve as valuable indicators of digital finance and its potential to bridge the financial inclusion gap for various societal segments, the chosen proxies were prioritized for their established role in traditional banking infrastructure and their accessibility across different regions in Nigeria. Future research could delve deeper into the impact of digital finance on financial inclusion by exploring additional indicators and considering the evolving technological landscape and shifting consumer behaviors in the financial services sector.

The model for the study is specified as follows:

$$FISt = \beta_0 + \beta_1 LnVIBt + \beta_2 LnVPOSt + \beta_3 LnVATMt + e \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

$FI = Financial\ Inclusion$

$LnVIB = Natural \log of\ Volume\ of\ Internet\ Banking$

$LnVPOS = Natural\ log\ of\ Volume\ of\ Point\ of\ Sale$

$LnVATM = Natural\ \log\ of\ Volumeof\ Automated\ Teller\ Machine$

$\beta_0 = Intercept$

$\beta_1 - \beta_3 = Partial\ regression\ parameters$

$t = The\ temporary\ dimensioni.e.$ 2011 – 2022

$e = ErrorTerm$

4. RESULTS AND DISCUSSION

Table 1: Descriptive Statistics

VARIABLES	FI	VIB	VPoS	VATM
Mean	0.459	3.050	1.160	5.19E+08
Median	0.486	7590	2726	4.17E+08
Maximum	0.505	3.430	4.390	9.68E+08
Minimum	0.363	2276	900	1.10E+08
Std. Dev.	0.051096	9.850	1.630	2.89E+08

Source: Autor Constructed

Table 1 presents the descriptive statistics, including the mean, median, standard deviation, minimum, and maximum values.

The average level of financial inclusion is 0.459, which might indicate that there's room for improvement in reaching more individuals with financial services. The Average volumes of internet banking, point-of-sale transactions and ATM transactions are 3.05E+08 (305 million), 1.16E+08 (116 million) and 5.19E+08 (519 million) respectively.

The standard deviation of 0.051 shows the variability in financial inclusion levels across the observations. The standard deviations for internet banking, point-of-sale transactions and ATM transactions are 9.85E+08 (985 million), 1.63E+08 (163 million) and 2.89E+08 (289 million) respectively. The variability in transaction volumes across the different channels (VIB, VPOS, VATM) is quite high, suggesting that there might be significant differences in the usage of these channels among the observations.

Diagnostic test

Prior to the main regression analysis, several diagnostic tests were conducted, including the Augmented Dickey-Fuller unit root test, Heteroskedasticity Test, autocorrelation test, and multicollinearity test.

Table 2: Augmented Dicker Fuller (ADF) test

Variable	Level	First Difference	5% critical value	Order of integration
	(P-value)	(P-value)	%	*I*
FIS	0.002	-	0.05	*I* (0)
LOG(VIB)	0.362	0.029	0.05	*I* (1)
LOG(VPoS)	0.827	0.000	0.05	*I* (1)
LOG(VATM)	0.112	0.000	0.05	*I* (1)

Source: Author Constructed

The results of the Augmented Dickey-Fuller (ADF) test indicate that the variables LOG(VIB), LOG(PoS), and LOG(VATM) became stationary after first differencing, as their p-values are less than the 5% significance level. This suggests that these variables are integrated into order one, denoted as I (1). In contrast, the variable FIS became stationary at level, indicating that it is integrated of order zero, or I (0). This finding is favorable for further econometric analysis.

Table 3: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Prob. 0.8712	F	(4.25)	Prob. 0.8103	Chi-Square	(4)
Prob. 0.9720	Chi-Square	(4)			
Obs*R-squared 0.962717					

Source: Author Constructed

The Breusch-Pagan-Godfrey (BPG) test is used to detect heteroscedasticity in a regression model. Heteroscedasticity occurs when the variance of the error term is not constant across all observations. The null hypothesis of the BPG test is that the error terms in the regression model are homoscedastic (have constant variance). The alternative hypothesis is that the error terms are heteroscedastic.

In this case, the p-value of 0.8103 is greater than the 0.05 significance level. Therefore, we fail to reject the null hypothesis. This means that there is no evidence of heteroscedasticity in the regression model. Based on the BPG test, we can conclude that the assumption of homoscedasticity is not violated in the regression model. This is a good indication that the model's estimates are reliable and can be used for inference.

Table 4: Correlation Matrix

VARIABLES	LOG(VIB)	LOG(VPOS)	LOG(VATM)
LOG(VIB)	1	0.401	0.401
LOG(VPOS)	0.302	1	0.513
LOG(VATM)	0.401	0.513	1

Source: Author Constructed

Internet banking and point of sale**:** A strong positive correlation (0.401) suggests a linear relationship between the two. As internet banking volume increases, point of sale volume tends to increase significantly. Internet banking and ATM: A positive correlation (0.401) indicates a strong linear relationship between the two. As internet banking volume increases, ATM usage tends to increase significantly. Point of sales and ATM: A moderate positive correlation (0.513) suggests a moderate linear relationship between the two. As point of sale volume increases, ATM usage tends to increase.

Relationships suggest that these services may complement each other, leading to increased financial inclusion. For instance, the growth of internet banking may drive the adoption of ATMs and point of sale terminals, especially in underserved areas. The analysis also indicates the absence of significant multicollinearity problem at 5% significant level.

Table 5: Model: Regression Result of Bridging the Financial Divide: The Impact of Digital Finance in Nigeria

Variable	Coefficient	t-Statistic	Prob.
C	-0.283	-0.629	0.546
LOG(VIB)	-0.009	-1.682	0.131
LOG(VPoS)	0.018	1.944	0.047
LOG(VATM)	0.029	1.030	0.333
R-squared	0.837	F-prob.	0.000
DW	2.005	F-Stat	13.694

Source: Author Constructed

R-squared: The R-squared value of 0.837 indicates that approximately 83.7% of the variation in the dependent variable is explained by the linear combination of the independent variables. This suggests a reasonably good fit of the model to the data. F-statistic and F-probability: The F-statistic (13.694) and its associated p-value (0.000) are highly significant, implying that at least one of the independent variables has a statistically significant impact on the dependent variable. LOG(VIB): The coefficient for LOG(VIB) is negative (-0.009), suggesting a negative relationship between the volume of internet banking (LOGVIB) and Financial Inclusion (FI). However, the t-statistic (-1.682) and its associated p-value (0.131) indicate that this relationship is not statistically significant at the conventional 5% level.

LOG(VPoS): The coefficient for LOG(VPoS) is positive (0.018), suggesting a positive relationship between volume of point-of-sale transactions (LOGPoS) and Financial Inclusion. The t-statistics (1.944) and its associated p-value (0.047) indicate that this relationship is statistically significant at the 5% level. LOG(VATM): The coefficient for LOG(VATM) is positive (0.029), suggesting a positive relationship between the volume of Automated Teller Machine transactions

(LOGVATM) and Financial Inclusion (FI). However, the t-statistics (1.030336) and its associated p-value (0.333) indicate that this relationship is not statistically significant at the conventional 5% level.

Based on the results, we can conclude that: LOG(VPoS) is the only statistically significant predictor of the dependent variable. A one-unit increase in the logarithm of VPOS is associated with a 0.018 unit increase in the dependent variable, holding other variables constant. LOG(VIB) and LOG(VATM) do not have a statistically significant impact on the dependent variable, even though their coefficients suggest potential relationships. Further investigation may be needed to explore these relationships further.

Discussion

The study sought to investigate the impact of digital financial technology in bridging the financial inclusion gap between 2011 to 2022. Specifically, the study examined how digital financial technologies such as Interne banking, point of sale terminals and automated teller machines have facilitated access to appropriate and affordable financial services, such as savings, loans, insurance, and payments, for all segments of Nigerian society. Financial inclusion was set as the dependent variable, while volume of internet banking (VIB), volume of point of sale (VPoS), and volume of automated teller machine (VATM) were used as independent variables representing digital financial technologies. Data on financial inclusion and stability, internet banking, point of sale, and automated teller machine usage were collected and analyzed using descriptive statistics and Ordinary Least Squares (OLS) regression analysis.

The findings indicate that point of sale (PoS) transactions had a significant positive impact (p-value: 0.047) on financial inclusion in Nigeria. However, automated teller machine (ATM) usage (p-value: 0.333) and internet banking (p-value: 0.131) did not have a statistically significant impact, with the latter showing a negative relationship.

Regression analysis revealed a negative, statistically insignificant relationship between internet banking and financial inclusion in Nigeria. This finding contradicts the expectations of researchers like Dayadhar (2019) and Mago and Chitokwindo (2014). The poor internet infrastructure and high data costs in Nigeria may have hindered the adoption of internet banking, limiting its impact on financial inclusion, as suggested by Moddibbo (2019).

While ATMs showed a positive association with financial inclusion, the impact was not statistically significant. This could be attributed to their limited availability in rural areas and their inability to dispense cash most of the time. This aligns with the findings of Ene et al. (2019) but contradicts the views of Monyoncho (2015).

Point of sale (PoS) systems, on the other hand, had a significant positive impact on financial inclusion. This aligns with the expectations and findings of researchers like Ene et al. (2019). The widespread adoption of PoS systems in rural and urban areas and their reliability in providing cash and payment services has streamlined

transactions and contributed to economic growth, thereby positively bridging the financial inclusion gap.

5. CONCLUSION AND IMPLICATIONS

The study set out to examine the impact of digital financial technology in bridging the financial inclusion gap in Nigeria, with a specific focus on internet banking, point-of-sale (POS) terminals, and automated teller machines (ATMs). The findings demonstrate that the objectives of the study have been largely achieved, as outlined: Assessment of digital financial technologies: The study successfully analyzed the role of digital financial technologies in driving financial inclusion. It revealed that POS systems have a significant positive impact on financial inclusion, particularly due to their widespread adoption in both urban and rural areas. However, internet banking and ATMs faced challenges such as poor network infrastructure, limited availability in rural areas, and low user adoption, which hindered their effectiveness. This finding aligns with the study's objective of evaluating the impact of specific digital financial channels on financial inclusion.

The study identified key challenges that limit the effectiveness of digital financial technologies in Nigeria, such as inadequate network infrastructure, low financial literacy, and limited accessibility of ATMs in rural areas. These findings provide actionable insights for policymakers and stakeholders, addressing the study's objective of identifying barriers to financial inclusion. The study recommends that to enhance financial inclusion, such as improving network infrastructure, expanding ATM availability, and conducting educational campaigns to familiarize users with digital banking services. These recommendations align with the study's objective of proposing strategies to promote the adoption of digital financial technologies. The study emphasizes the need for collaboration among stakeholders, including the government, network providers, banks, and regulators, to address the challenges identified. This highlights the study's objective of fostering a multi-stakeholder approach to achieving financial inclusion.

By highlighting the role of digital financial technologies in bridging the financial inclusion gap, the study contributes to the broader goal of economic growth and sustainable development. This aligns with the study's objective of exploring the economic implications of digital financial inclusion. The findings underscore the transformative potential of digital financial technologies in bridging the financial inclusion gap, while also highlighting the need for targeted interventions to address existing challenges. By achieving these objectives, the study provides a comprehensive framework for leveraging digital finance to promote financial inclusion and drive economic development in Nigeria.

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