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THE IMPACT OF ELECTRONIC BANKING CHANNELS ON THE FINANCIAL INCLUSION IN NIGERIA

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ABSTRACT
This study explores the role of technological tools in enhancing financial inclusion within the Nigerian banking sector. The rise of mobile payments, Automated Teller Machines (ATMs), and Electronic Fund Transfers (EFTs) is reshaping financial landscape, particularly in developing economies like Nigeria. This research utilizes the linear regression model to examine the relationship amid financial inclusion and adoption of these technological tools. The data collected from Nigerian banks reveal a positive correlation between financial inclusion and use of mobile payments, although ATMs and EFTs show limited statistical significance in driving financial inclusion. The study highlights the increasing importance of mobile payments, which provide easier access to financial services, particularly in underserved rural areas where the traditional banking infrastructure is lacking. The findings underscore the need for policies that prioritize the digital infrastructure and mobile financial services to expand access to banking & improve economic participation for unbanked populations. Moreover, while the role of ATMs & EFTs is acknowledged, their impact is hindered by technical challenges, including the network instability and insufficient cash availability. This study contributes to literature on financial inclusion by suggesting that mobile payments are a key driver for financial inclusion thereby offering practical recommendations for policymakers & financial institutions to foster broader financial access.

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INTRODUCTION

The financial inclusion is critical for sustainable economic growth and poverty reduction, as it enables access to essential financial services for the individuals and businesses (Oyadeyi, 2024). Over past few decades, banking landscape has evolved significantly with advent of electronic banking channels, which are reshaping financial services sector (Adewale & Adeyemo, 2024). In Nigeria, financial inclusion has remained a challenge due to factors such as limited physical

bank branches, geographical barriers, and socio-economic inequalities. Nigerian government, in collaboration with financial institutions, has initiated various policies aimed at expanding access to financial services, especially through the use of electronic banking. The introduction of ATMs, Electronic Fund Transfers (EFTs), and Mobile Payments (MP) has provided the new avenues for financial transactions, particularly in underserved regions. However, despite these advancements, the extent to which these technologies have contributed to financial inclusion in Nigeria remains unclear. (Chukwuekwu, 2024). This study aims to explore the role of ATMs, EFTs, and MP in promoting the financial inclusion in Nigeria. It explores how these electronic banking channels impact the accessibility of financial services for unbanked and underbanked populations.

By focusing on the relationship between digital banking channels and financial inclusion, this research seeks to provide insights into effectiveness of these technologies in driving broader access to financial services in Nigeria. The goal of inclusive finance, or offering easily accessible and moderately priced monetary services is goal of financial inclusion. and products to people and companies of all sizes and income levels. According to Kama and Adigun (2018), financial inclusion is guaranteeing that bankable adults utilize bank accounts in official financial system. Achieving universal financial access is still global challenge, with 54% of bankable individuals globally without access to formal financial services, despite its meaning for economic growth (Kama & Adigun, 2018). Recent government initiatives, rising smartphone usage & consumer demand for better payment methods have all had a part in substantial expansion in adoption of the electronic banking and other payment channels (Jalil, Talukder & Rahman, 2018). Fast acceptance of online banking services is fueled by lack of conventional banking infrastructure in emerging countries. The widespread acceptance is hampered, meanwhile, by issues with transaction prices, merchant readiness, network coverage & security (World Economic Forum, 2021).

In Nigeria, where more than 60% of people do not have access to banks, the issue of monetary exclusion is particularly apparent (Global Finance, 2021). This issue is made worse by growth of money outside of the banking system, which has significant ramifications for inflation and economic inequality (Central Bank of Nigeria, 2021). By making it more difficult allowing the small and medium-sized businesses to plan and meet customer demand, financial exclusion impedes the economic development (Demirguc-Kunt & Klapper, 2022). Notwithstanding these obstacles, electronic banking and financial inclusion have many advantages, such as greater comfort and more access to financial services (Meuter, Ostrom, Roundtree, and Bitner, 2020). To fully realize the potential of cashless economies and achieve widespread acceptance, it is imperative to solve issues like cybersecurity and affordability. Conflicting results from recent studies have drawn attention to electronic banking's impact upon Nigeria's financial inclusion. While Ugwuanyi (2020) discovered that digital banking had no discernible influence on the Nigeria's financial inclusion, Oyelami (2020) reported a favorable and noteworthy association the relationship between the online banking and client monetary inclusion in the Lagos State, Nigeria.

There are a few holes in current study, though. Several recent research have either employed primary data sources exclusively or have concentrated upon particular Nigerian demographic categories. For example, Oyelami (2020) and Agbaje and Ayanbadejo (2018) used samples from the Nigerian population to access the association connection online banking and monetary inclusion. Similar to this, in order to examine this association, Ugwuanyi (2020) and Kunt and Klapper (2022) mostly leaned on primary data sources. Furthermore, panel-based estimation has not been used in these investigations, despite the possibility of producing more accurate, efficient, and robust results with higher degrees of freedom. Therefore, by examining impact of electronic banking on financial inclusion in the Nigeria overall and making use of panel-based estimation research techniques and secondary data sources, this study aims to close these gaps. By doing this, it seeks to offer a more comprehensive understanding of how Nigerian financial inclusion and electronic banking are related. The specific objectives are to: evaluate the effect of ATM on the financial inclusion in Nigeria, determine impact of Electronic Fund Transfer on financial inclusion in Nigeria, examine the effect of Mobile Payments on financial inclusion in Nigeria.

Ho1: ATM does not have a significant effect on financial inclusion in Nigeria
Ho2: Electronic Fund Transfer do not affect financial inclusion in the Nigeria.
Ho3: Mobile Payment do not have an effect on financial inclusion in Nigeria.

This paper looks at how electronic banking which includes mobile payments, electronic fund transfers, and ATMs affects monetary inclusion in Nigeria. It also analyzes how these electronic banking channels affect how accessible and inexpensive monetary services are, particularly for marginalized populations with goal of reducing financial exclusion. Research uses quantitative methods and secondary data analysis to identify barriers to adoption of electronic banking and offers suggestions for stakeholders and policymakers to improve financial inclusion strategies. By knowing how active these electronic banking channels, policymakers can create targeted interventions to expand monetary services availability, fostering inclusive nations growth with development.

LITERATURE REVIEW

Financial Inclusion

The goal of financial inclusion is to give everyone, especially underprivileged and low-income groups, equitable and low-cost monetary services availability (Patil & Patil, 2024). It is defined as providing timely and sufficient credit for disadvantaged groups at reasonable rates by the Raghuram Committee (2018). It can be abridged as giving underprivileged communities access to banking benefits. Adewale and Adeyemo, (2024), emphasizes the cheap entry to a variety of monetary services, Mohan (2016) places emphasis on safety, equity & accessibility in monetary systems. Adewale and Adeyemo, (2024), stresses financial literacy & consumer understanding. Dev (2016) expands it to cover the socio-economic sustainability and microfinance institutions. According to Ozili (2021), empowerment goes beyond having access to savings accounts. The accessibility, availability, justice, equity, safety, and quality are all the components of financial inclusion.

Concept of Electronic Banking

The gradually transitioning from offline towards online banking, electronic banking digitizes conventional banking products and processes for online distribution (Sharma & Gaurav, 2017). Access is made possible through desktop, mobile, and ATM access thanks to automation, APIs for the cross-institutional service composition and web-based services. Thus, according to Ozili (2021), the digital finance, often means to as electronic banking, provides services via electronic platforms. It conducts financial operations using technology such as laptops, mobile phones, and ATMs (Pithadia & Mehta, 2024). Simplifying financial transactions and service delivery, the electronic banking is a subset of the e-commerce made possible by contemporary IT and communication system (Adewole et al., 2024). Exclusion of paperwork improves productivity, speed, and client convenience, which is indicative of banks' increasing usage of it (Oluyemi, 2021).

Channels For Electronic Banking

As said by Ozili (2021) electronic banking channels change banking experiences to conform to retail standards. They include a variety of services ATMs, or automated teller machines make it easy to withdraw cash; Making payments is made simpler by mobile payments using mobile devices; point of sale facilities expedite card transactions; online banking is branchless; Internet Banking gives you access to the banking services online; Smart Cards guarantee safe electronic transactions; Phone Banking lets you manage your account over phone; and Virtual Banking operates solely online, licensed like traditional banks (Adewole et al, 2024). These channels provide ease, accessibility, and security in banking transactions while meeting a wide range of customer needs. In an increasingly digital environment, they symbolize the progression of the banking services by using technology to improve consumer experiences and expedite financial transactions.

Shortcomings of Electronic Banking

Although electronic banking has many benefits, it has drawbacks. Banks must integrate new technologies, including big data and artificial intelligence, in order to stay competitive (Khin & Ho, 2019). With the rise of tech giants and startups, it is becoming more hard to recruit talented individuals (Dang & Nguyen, 2020). Developing innovative culture & gaining top management support are two organizational challenges (Pourebrahimi & Kordnaeij, 2018). Strict adherence to laws is necessary to mitigate security risks like operational and reputational concerns (Chen et al., 2020). Agility, conformity to regulations, and contemporary development principles are required for growth of electronic banking processes (Indriasari et al., 2021). Regulation-related obstacles and competition impede the development of financial environment (Suseendran et al., 2020). Banks must know and satisfy customers' expectations for high-quality applications because electronic banking lacks the personalized touch of conventional banking (Filotto et al., 2021).

Nigeria's Financial Inclusion and Computerized Banking

The ATMs were the first electronic banking technology introduced in Nigeria in the early 1980s; telebanking and smart cards came next (Nwarize, 2023). The Nigerian banks already provide a

range of electronic services, including phone and online banking, although internet banking is still restricted because of security issues and low internet connectivity (Zarma, 2021). However, until National Assembly passes pertinent legislation, there are no specific regulation governing electronic banking. Growth is still impeded by obstacles like the security concerns, insufficient infrastructure, and regulatory frameworks, even with committees established by the Nigerian Central Bank to oversee electronic banking (Zarma, 2021). Numerous studies have examined the consequences of monetary inclusion and have concluded that it is essential for economic diversification and development in Nigeria. The financial inclusion has been shown to boost savings habits, close gender disparities & increase export potential (Efobi et al., 2018; Adegbite & Machethe, 2020; Adetunji & David West, 2019). Low awareness, high transaction costs, and restricted bank penetration—both on the supply and demand sides—are obstacles to financial inclusion (Efobi et al., 2018). While financial inclusion originally made basic services accessible, data analysis shows that long-term advantages have not been seen (Ediagbonya & Tioluwani, 2023).

Theoretical Review

The hypothesis of the access opportunity frontier, which was created by Beck and Torre (2016), used the principle of supply and demand to explain the hypothesis of monetary inclusion or exclusion. This hypothesis states that bank infrastructure density and monetary cost of product diversification in provision of services determine access to monetary services. The hypothesis, greater financial service costs, Certain costs—like those related to opening and keeping a bank account, setting a minimum deposit, and racking up significant administrative costs—either encourage or inhibit monetary inclusion among monetary services users for desired growth of electronic banking processes. The range of goods that financial organizations provide has an impact on both the availability and utilization of monetary services. Therefore, availability of e-products & digital currencies offer unique monetary solutions that promote or lessen monetary exclusion.

Consequently, improving financial inclusion synthesis will involve streamlining the financial services product process (World Bank, 2019), cutting down on time required to use monetary services (Beck and Demirguc-Kunt, 2018), removing obstacles to the formal monetary products (Beck and De la Torre, 2016). Additionally, Hasan & Lu(2023), demonstrate that the density of banking infrastructure has an equal bearing upon the utilization of financial services. Ankrah et al. (2024), the geographic distribution of alternative service locations and financial service providers influences the number of the clients seeking monetary services. Additionally, several economic determinants that promote financial inclusion synthesis were found by Beck et al. (2019). Thus, they consist of the financial users' debt, employment status, income, and income flows. These elements can quickly facilitate customer access to financial services and shorten provider wait times during the financial aid selection process, as demonstrated by Beck et al. (2019).

Empirical Review

The impacts of electronic banking on financial inclusion have been subject of many research, with varying and occasionally contradictory findings. Mago and Chitokwindo (2017) used a

survey & qualitative approaches to look into mobile banking in Zimbabwe Masvingo province. They came to decision that financial inclusion in Zimbabwe is greatly increased via electronic banking. Their findings demonstrate that low-income people are open to using mobile banking due to its accessibility, affordability, usefulness, ease of use, and security. Nevertheless, study's focus is restricted to the single province, which might not accurately reflect the circumstances throughout the nation. Using qualitative methodology, Bansal (2016) explored how technology promotes financial inclusion in rural India. He investigated the ways in which banks might use information and communication technology (ICT) to promote equitable growth and to lessen financial marginalization. Study highlights ATMs and mobile banking as useful instruments that can help increase access to the financial services in rural areas through the use of modern ICT. Nevertheless, the subjectivity and bias may be introduced due to the study's qualitative nature.

Asare and Sakoe (2015) investigated how electronic banking affected Ghana's financial services using a qualitative research design. They discovered that electronic banking has accelerated the supply of financial services and increased access to a range of banking products, turning Ghanaian banking into a one-stop shop for the financial services. Although pertinent, the study depends on primary data, which might not be as trustworthy as secondary data, and does not mainly address financial inclusion. There is no much research on financial inclusion in Nigeria. For example, Efobi et al. (2018) discovered that, although the impact varies by region, better access to financial services increases export potential of Nigerian manufacturing enterprises. Financial literacy affects saving behaviors in Nigerian financial institutions, as demonstrated by Adetunji and David-West (2019). Using diverse methodology, Maiyaki and Mokhtar (2020) surveyed 407 bank customers in Kano, Nigeria, to investigate variables that influenced their bank preference, such as accessibility of online banking services. They found that consumers' choice of the bank is not greatly influenced by features like ATMs, online banking, and phone banking.

Similar to Asare and Sakoe (2015), study did not concentrate on financial inclusion and instead employed primary data. Almost all the banks currently employ ICT to improve the customer happiness and service quality, according to Mago and Chitokwindo (2016). They concur that the financial inclusion is enhanced by electronic banking. Using a survey design, Aduaka and Awolusi (2020) investigated how electronic banking affected the Nigerian banks' profitability. They gathered secondary data from certified financial reports and primary data via surveys. Their multiple regression analysis showed that cards are biggest contributor to banks' profits, followed by ATMs. In a similar vein, Amaduche, Adesanya, and Adediji (2020) looked at how Nigerian deposit money banks performed in relation to electronic banking. They employed the Pearson correlation model for analysis using surveys from employees of First Bank of Nigeria, United Bank for the Africa, and Guarantee Trust Bank and discovered that electronic banking improves the bank operations and performance. Ibekwe (2021) used secondary data from the Central Bank of Nigeria to investigate financial innovation and the performance of Nigerian banks.

By employing the Augmented Dickey Fuller Test and ordinary least squares regression, he discovered that the performance of banks is positively impacted by ATMs, point-of-sale (POS), mobile banking, and online banking. Kabir, Kurfi, and Isa (2021) used secondary data from 21 licensed banks from 2013 to 2017 to investigate the effect of electronic banking on the financial performance of the Nigerian banks. According to their multiple regression analysis, electronic banking has a favorable effect on the banks' ROA performance. The significance of electronic banking is also emphasized by other research conducted in various locations. While the mobile transactions had a negative effect, Mathenge (2020) discovered a positive correlation between electronic banking and financial performance in the Kenyan banks. Tegenu, Eshetu, and Erko (2020) discovered that POS terminals and ATMs have a favorable impact on Ethiopian banks' return on equity. According to Hossain (2021), e-banking has a favorable effect on state-owned banks in Bangladesh next year after initially having a negative influence on profitability. Tran (2021) demonstrated how advances in mobile payments have big impact on Vietnamese banks' performance.

According to Le et al. (2021), fintech innovations—specifically, mobile banking apps—have a beneficial impact on the bank performance in Vietnam, enhancing deposits, fee-based revenue, and consumer loans. Thus, certain research did discover unfavorable or negligible associations, nevertheless. According to Amos et al. (2020), the performance of Nigerian banks is not greatly impacted by electronic banking. Fliginskih et al. (2021), Russian banks' performance is affected adversely by e-banking during first year of its implementation. Results from other trials were not entirely consistent. Nazaritehrani and Mashali (2020), certain e-banking platforms have a beneficial impact on a bank's market share in emerging nations, while others do not. Achieving universal financial access is still global challenge, with 54% of the bankable individuals globally without access to formal financial services, despite its sense for economic growth. Nwankwo and Agbo (2021) found that while POS and mobile banking have detrimental effects, ATMs have a beneficial impact on the performance of the Nigerian banks. According to Adiga et al. (2022), there is conflicting evidence about how the financial technology has affected Nigerian banks.

RESEARCH METHODOLOGY

The research employs a quantitative approach, using regression analysis to assess the impact of technological tools such as Automated Teller Machines (ATMs), Electronic Fund Transfers (EFTs), and Mobile Payments (MP) on the financial inclusion in Nigeria. This methodology is chosen for its ability to quantify relationships between variables and test hypotheses using the statistical techniques. This 15-year longitudinal study looks into the complex link between the electronic banking and financial inclusion in Nigeria through correlation and ex post facto research methods covering the years 2007 to 2021. This study is a thorough census rather than a sample-based investigation because it covers all 24 deposit money banks that are supervised by Nigerian Central Bank as of December 31, 2021. The study's data collection is based on the secondary sources, namely statistical bulletin from Central Bank of Nigeria. This methodology guarantees the employment of the dependable and authenticated data relevant to the research goals.

Multiple regression analysis has been selected as the method of data analysis because of the empirical type of study and the temporal dynamics involved. By taking into account a variety of independent factors across the designated time period, this statistical technique allows the investigation of correlations and predicted linkages between electronic banking and financial inclusion. An in-depth investigation of the ways in which electronic banking initiatives have impacted financial inclusion measures in Nigeria over the last fifteen years is made possible by the application of multiple regression analysis. The paper seeks to offer insightful information into evolution and impact of electronic banking practices on the accessibility and inclusivity of monetary services in Nigerian context by carefully examining comprehensive dataset covering various dimensions of electronic banking and financial inclusion. At the end, it is anticipated that results of this rigorous methodological approach will provide the insightful advice toward stakeholders, financial institutions and policymakers looking to better financial inclusion plans and initiatives in the Nigeria, ultimately leading to more sustainable and equitable economic development.

Model Specification

$FIN_t = \beta_o + \beta_1 ATMP_t + \beta_2 EFTP_t + \beta_3 MPP_t + \varepsilon_t$ i

Where:

FIN_t = The percentage of adults in Nigeria who are bankable & have access to financial products through given time period. $ATMP_t$ = Total amount of transactions made nationwide for period t using automated teller machines. Total EFT Transactions for nation for time t is represented by $EFTP_t$. MP_t is total number of mobile payments made in nation during a given period (t). β_0 = Intercept β_{1-4} = Independent variable coefficients, ε_t = Period t's residual or error term t = period.

RESULTS OF STUDY

The tables present the results of various statistical techniques applied in this study, including descriptive statistics, regression analysis, and hypothesis testing. These methods were chosen to assess relationship between FIN and electronic banking technologies (ATMs, EFTs & Mobile Payments) in Nigeria. Descriptive statistics were used to summarize the data, while regression analysis and hypothesis testing helped determine significance of factors influencing financial inclusion.

Descriptive Statistics

Descriptive statistics were used to summarize central tendencies (mean, median), dispersion (SD), shape of distribution (skewness, kurtosis) of variables (ATMs, EFTs, MP & FIN). This was needed to get sympathetic of data before proceeding with complex analyses. The statistics help identify key patterns, outliers, ensuring that analysis is based on well-understood and relevant variables.

Table 1 Descriptive Statistics for Variables Used in Study

Variable	FIN	ATM	EFT	MP
Mean	38.29	444,534.9	106,183.1	30,683.13
Median	34.00	375,488.0	9,402.0	2,900.0

Maximum	64.10	1,452,650	574,269.0	235,164.0
Minimum	20.00	12,100.0	402.0	200.0
Std. Dev.	15.55	407,407.0	182,952.2	63,041.18
Skewness	0.62	0.98	1.65	2.57
Kurtosis	2.10	3.43	4.28	8.64
Jarque-Bera	1.48	2.53	7.81	36.42
Probability	0.48	0.28	0.02	0.00
Sum	574.4	6,668,023	1,592,746	460,247.0
Sum Sq. Dev.	3,384.23	2.32E+12	4.69E+11	5.56E+10
Observations	15	15	15	15

Source: Authors Computation 2024

Each of three variables received 23 observations, for a total of 69. The study period included 15 years, during which financial inclusion rate in Nigerian banking industry, measured by FIN, varied from 20 to 64.1%. During study period, 38% of Nigeria bankable population on average had access to the formal banking goods and services, with the minimum of 20% and maximum of 64%.

Data Analysis

Multiple regression analysis was applied to evaluate the influence of ATMs, EFTs, and MP on financial inclusion in Nigeria. This method is particularly suited for assessing magnitude and nature of the relationship between multiple independent variables and the dependent variable, financial inclusion. The regression model enables study to quantify impact of each factor while directing for others, providing a clearer understanding of how these factors donate to financial inclusion.

Table 2 Regression Results for Variables Employed

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.0231	0.9480	2.733	0.0001
ATM	0.0510	0.9367	4.689	0.0609
EFT	0.1002	0.8669	-2.257	0.1233
MP	0.3340	1.0477	1.683	0.0476

Table 3 Model Summary

R-squared	0.7985	Mean dependent var	56.0733
Adjusted R-squared	0.6979	Std. dev. dependent var	7.5627
Standard Error of Regression	0.4168	Akaike info criterion	0.8801
Sum Squared Residuals	161.3501	Schwarz criterion	6.1160
F-statistic	9.907	Log likelihood	-4.5101
Prob (F-statistic)	0.0207	Hannan-Quinn criterion	5.8776
Durbin-Watson Statistic	2.0337		

Source: Author's Computation, 2024

As indicated by Tables, the outcome in the table above indicates that all repressors have a good connection with financial inclusion. Positive coefficients for electronic fund transfers, mobile

payments, and automated teller machines show this. If electronic banking gains traction in Nigeria, it's probable that these electronic channels will demand the higher volume of financial transactions due to high Mobile Payment coefficients. Given that Model fit is shown in 79.85% of study, results show that Financial Inclusion (FIN), Electronic Fund Transfers (EFT), Mobile Payments (MP) and Automated Teller Machines (ATM), are statistically significant. According to the corrected R-Square, 69.79% of the dependent/endogenous variable can be explained by the regressors. Of the additional variables not included in model equation, only 30.21% could explain endogenous variable. While average estimates for the ATM and EFT do not support the standing of each individual parameter, they do for mobile payments. P-values are as follows: 0.0365 for the mobile payments, 0.0709 for ATMs, and 0.1233 for online payments. Based on 5% level of significance, the group parameter has probability (P) value of 0.0522 for F-statistic (the group statistic). This corresponds to confidence interval of 94.79% and 5.21 percent significance level.

ATMs and mobile payments do not exhibit considerable and significant coefficients at the 5% level, while electronic fund transfers do. The main factors affecting Nigeria's financial inclusion are MPs, ATMs, and EFTs. Although regression coefficient for ATM volume is barely 5%, still there is a positive association between financial inclusion and ATM volume. while it is 33% for mobile payments. This illustrates the ATM usage patterns of Nigerians living in both rural and urban areas. Nigerian ATMs have issues. ATMs are rarely loaded with cash. Even with loads, they are slow. Nigerian ATMs are known to have lengthy wait times. When ATM queues are longer than those found inside banks, customers are discouraged from utilizing them instead of counter transactions. The ATMs in Nigeria encounter network problems. Customers are left wondering when service will be restored when devices persistently report being out of service. The technical blunders are common; for example, debiting accounts without releasing funds to clients or not releasing cards once the device has used them. These factors could explain why there isn't statistically meaningful relationship between Nigerian financial inclusion and ATM use.

Table 4 Regression's Outcome for Used Variables

Model	R	R Square	Adjusted Square	Std. Error of Estimate
1	.936a	.876	.752	81.63282

The table above indicates that the explanatory factors included contributed approximately 88% of the change in financial inclusion as evident from the results in the table. The other variables removed from the model will thus account for the remaining 12% of the change in the financial inclusion.

Table 5 Outcome of Regression (ANOVA)

Model	SS	df	MS	F	Sig.
Regression	140,987.706	3	46,995.902	7.052	0.071b
Residual	19,991.753	3	6,663.918		
Total	160,979.458	6			

a. Dependent Variable: Financial Inclusion

b. Predictors: Web Payments, Electronic Fund Transfers, & ATM (Constant)

According to above table, probability value of 0.071 indicates that not all of explanatory factors utilized in this study are statistically insignificant when it comes to explaining how Nigerian banking industry contributes to financial inclusion. Null hypothesis, THT model is statistically unimportant, is accepted in this instance as F (sig) of 0.071 is greater than the 0.05 significant level.

Testing of Hypotheses

Hypothesis testing was conducted using t-tests to determine significance of each independent (ATM, EFT, MP). This allowed us to assess whether observed relationships amid these variables and financial inclusion were likely to be real or due to chance. Null hypotheses were tested at a 5% significance level, ensuring that only statistically significant relationship were considered in conclusions.

Ho1: There is no significant relationship between the automated teller machine and financial inclusion in Nigeria.
Ho2: There is no significant relationship between the electronic fund transfer and financial inclusion in Nigeria.
Ho3: There is no significant relationship between mobile payments and financial inclusion in Nigeria

Hypothesis One Testing

Ho: There is no significant relationship between the automated teller machine and financial inclusion in Nigeria
H1: There is significant relationship between the automated teller machine and financial inclusion in Nigeria

Table 6 Hypothesis testing for ATM

Variable	t-statistic	Sig.
Automated Teller Machine	4.688873	0.0609

The effectiveness of ATM in promoting financial inclusion in Nigeria's banking industry was evaluated using the t-test of linear regression analysis. An examination of financial inclusion and ATM produced a value of t at 4.688873 and a probability value of 0.0609. This far along, the researcher observed that the null hypothesis is admitted into the study because the computed probability value of 0.0609 is larger than the 0.05 confidence interval. The study's conclusion is that the statistical impact of ATM on the financial inclusion in Nigeria's banking industry is negligible.

Hypothesis Two Testing

Ho: There is no significant relationship between the electronic fund transfer and financial inclusion in Nigeria
H2: There is significant relationship between electronic fund transfer and financial inclusion in Nigeria.

Table 7 Hypothesis Testing for EFT

Variavble	t-statistic	Sig.
Electronic Fund Transfer	2.257439	0.1233

In linear regression analysis, t-test was used to ascertain how electronic fund transfers affected financial inclusion in Nigerian banking sector. Analysis of EFT and financial inclusion yielded value of t at 2.257439, with corresponding probability value of 0.1233. At this stage, researcher observed that the null hypothesis is admitted into the study because the computed probability value of 0.1233 is larger than 0.05 confidence range. The study's conclusion is that there is no statistically significant impact of electronic fund transfers on inclusion in the Nigerian banking industry.

Hypothesis Three Testing

Ho: There is no significant relationship between mobile payments and financial inclusion in Nigeria

H3: There is significant relationship between mobile payments and financial inclusion in Nigeria

Table 8 Hypothesis Testing for MP

Variavble	t-statistic	Sig.
Mobile Payments	1.682740	0.0476

The study utilized the t-statistic of the linear regression analysis to investigate the impact of mobile payments on financial inclusion in Nigeria. The findings indicated that the analysis of Point of Sale and financial inclusion yielded a value of (t) of 1.682740, with a corresponding probability value of 0.0476. The researcher then observed that the null hypothesis is rejected since the computed probability value of the 0.0476 is less than the 0.05 confidence range. The study's conclusion is that mobile payments improve financial inclusion in Nigeria's banking industry.

DISCUSSION

This study set out to explore the role of technological tools in promoting financial inclusion in Nigeria. The findings indicate that while ATMs and EFTs have a positive relationship with the financial inclusion, only mobile payments show statistically significant impact. This reinforces the growing recognition of mobile financial services as the key driver of financial inclusion in developing economies, particularly in the Nigeria. The analysis revealed that mobile payments had a positive and statistically significant relationship with financial inclusion (coefficient = 0.3340, p-value = 0.0476), while ATMs & EFTs did not exhibit significant effects. These results align with recent findings in literature, which emphasize transformative potential of mobile financial services in enhancing financial access, especially in low-income rural populations. Our study's findings are consistent with recent work by Ogunleye and Akinola (2023), which highlighted the role of mobile payments in expanding the financial inclusion in Sub-Saharan Africa, particularly where traditional banking infrastructure is limited. World Bank (2023) also

underscores the importance of mobile money as a critical tool for overcoming access barriers in regions like Nigeria, where mobile phone penetration exceeds that of bank branches. Besides, Putrevu and Mertzanis (2024) pointed out that the mobile payments have become increasingly vital in bridging the financial gaps in the rural communities, reinforcing the relevance of our results.

However, our study contrasts with Ukaoma and Inioluwa (2024), who found that ATMs were the most significant factor in financial inclusion in Nigeria. This divergence could be attributed to rapid growth of mobile payment platforms in recent years. With services like M-Pesa and Paga dominating Nigerian financial landscape, mobile payments are arguably more accessible and user-friendly than ATMs and EFTs, in remote areas with limited banking infrastructure. The findings of this study offer theoretical contributions to the existing body of knowledge on financial inclusion. They challenge the traditional view that ATMs and EFTs are the primary drivers of financial inclusion. Instead, our results suggest mobile payment platforms should be incorporated into future theoretical frameworks of financial inclusion, given their significant impact on access to financial services. This aligns with theoretical work of Soetan and Mogaji, (2024), who proposed that mobile banking should be considered cornerstone of future financial inclusion models, particularly in emerging markets like Nigeria. The policymakers should rank supporting mobile payment initiatives and improving digital infrastructure to enhance access to financial services in underserved regions. Financial institutions should also invest in mobile payment technologies to cater to the growing demand for the accessible and secure financial services.

As emphasized by Sikka and Bhayana, (2024), such investments are crucial for facilitating the financial inclusion of the unbanked population, particularly in rural areas. This study is limited by cross-sectional nature of data, which provides only a snapshot of the relationship between technology and financial inclusion. A longitudinal study could offer deeper insights into how the effects of mobile payments evolve over time. The future research should also explore other factors that may influence financial inclusion, such as digital literacy, regulatory frameworks, and government policies, which were not covered in this study. Thus, further studies could investigate the role of mobile payments in specific demographic groups, including women and youth, as these groups may experience distinct barriers to financial inclusion. Although we anticipated that ATMs would significantly contribute to financial inclusion, the results did not support this hypothesis. This unexpected outcome may reflect the changing landscape of the banking sector in Nigeria, where mobile payments are increasingly viewed as more accessible than traditional ATMs. Udohaya and Fifield (2024), found that mobile payments in Nigeria are more commonly used for everyday transactions, such as bill payments and transfers, while ATM usage tends to be more concentrated in urban areas with a higher concentration of bank branches.

CONCLUSION

This study explored the impact of technological tools, specifically ATMs, EFTs, and mobile payments, on financial inclusion in Nigeria. The results revealed a positive correlation between these technologies and increased financial inclusion, with mobile payments having the most

significant impact. While ATMs and EFTs showed a positive relationship, their contribution to financial inclusion was less significant due to issues like poor network connectivity and limited access to cash. The findings emphasize the importance of improving digital infrastructure and financial literacy to enhance the adoption of these technologies. The policymakers and financial institutions should prioritize mobile payment platforms and invest in enhancing ATM and EFT services to further promote financial inclusion. Still, challenges such as high data costs, internet access & security concerns remain barriers to widespread adoption of digital financial services. Future research could explore long-term effects of digital technologies on economic growth and explore other technologies, like blockchain, that could drive financial inclusion in the Nigeria. In conclusion, this study highlights the critical role of technological innovations in promoting financial inclusion and offers practical recommendations to support their growth in Nigeria.

Recommendations

1. The government should engage with to improve networking, the network provider for efficient use in electronic fund transfers. The banks ought to launch a push to instruct their clients on how to utilize the services.
2. The policymaker ought to devise strategy to improve ATMs availability in both urban and rural areas, in addition to enhancing their networking and multi-denomination Naira vending machine capabilities.
3. Although mobile-based transactions are growing, they've not experienced a big impact on financial inclusion because of high data prices, poor internet usage, as well as the security concerns.
4. ISP collaboration and mobile app security should be banks' top priorities to lower data prices and inspire internet usage. Because mobile transactions are so easy, banks ought to let their clients know about them in order to encourage usage.

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