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Original Article

Digital Banking Technology and Financial Inclusion in Nigeria

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Abstract - The paper empirically tests the effect of the digital banking model on financial inclusion in Nigeria. The study adopted the financial time series methodology in collecting quarterly data, and these secondary data were extracted from the Central Bank of Nigeria Statistical Bulletin (2021) for a period of twelve (12) years ranging from 2009 – 2021. Quarterly time series data on the volume of transactions on Automatic Teller Machines (ATM), volume of transactions on the Point of Sale (POS), volume of transactions on Web Banking Technology (WBT), and volume of transactions on Mobile Banking Technology (MBT) in Nigeria form the independent variables. At the same time, the ratio of total deposit to gross domestic product was used as a proxy for financial inclusion in Nigeria. The estimation technique of the pairwise granger causality test was used to analyze the data. The pairwise granger causality test was used because it has proven useful in describing whether a one-time series is useful in forecasting another. The paper found that the digital banking model significantly and critically influences Nigeria's financial inclusion. Therefore, we conclude that despite the challenges faced by the banks in Nigeria, there is still great potential for incorporating more mobile and internet-based banking services into the banking system in order to improve financial inclusion in the country.

Keywords - Digital banking, Mobile banking, Financial technology, Financial inclusion, Banking sector, Nigeria.

1. Introduction

The significance of bringing millions of unbanked Nigerian citizens into the financial ecosystem and increasing access to financial products and services have been on the center stage of discussion among scholars and managers of the nation's economy. Thus, financial inclusion is delivering financial products and services at affordable prices to less privileged and low-income segments of society. This implies that financial inclusion is about reducing the cost of entry into the financial system [17].

However, the growing popularity of financial transactions and payments through cell phones and mobile money shops has revealed the overwhelming potential to expand financial inclusion through digital banking technology. This digital banking model has already advanced the lives of millions of Nigerians by reducing the need to carry cash or travel long distances to reach the nearest point of service [16]. Knowing full well that population density in many rural areas is too low to support rural bank branches and the time/ cost of travel to reach conventional mortar and brick banks is too prohibitive for people with low incomes and the unbanked. As many economic agents continue to entrust more of their savings and resources to conventional/ traditional banks, they require more frequent access beyond weekly or monthly visits to the bank. In order to increase financial access beyond the banking walls and local branches, the introduction and use of digital technology is necessary.

This financial innovation has helped to improve the efficiency of financial transactions and reduced operational costs, providing more frequent opportunities to open and access customers' accounts in real time. Digital banking channels can give bank customers access at any time of the day through cell phones, online banking, and USSD; with millions of people in Nigeria, who have a mobile phone but lack a simple bank account, digital banking offers an attractive means to achieve increased financial access.

Many cell phone users through Mobile Network Operators (MNOs) now have the option to perform payment services by using the value of their airtime to transfer money and pay bills or insurance premiums. However, despite that Nigeria's overall financial inclusion rate continues to grow incrementally that is from 36.3% in 2010 to 50.5% in 2020, Enhancing Financial Innovation and Access (EFInA) reported that 38.1 million Nigerians, i.e. 35.9% were financially excluded in 2020 for reasons bordering on limited access to banks due to distance from dwelling places, little/irregular income, cost of banking services, unemployment and institutional exclusion.

In recent times, Nigeria as a country has witnessed a significant increase in digital technology usage, with 81% of the Nigerian adult population of 106 million having a mobile phone, 45% active digital stored-value accounts and 28% active digital financial services users in 2020 compared to 69%, 41% and 16% of 100 million adult populations Nigerians in 2018 (EFInа Survey, 2020). In light of the above, the paper seeks to investigate the effect of digital banking technology on expanding financial inclusion in Nigeria.

2. Literature Review

In this section, we will look at the theoretical and empirical reviews of the research subject.

2.1. Theoretical Framework

This study is underpinned by the following theories.

2.1.1. Technology Acceptance Model

The Technology Acceptance Model is also known as TAM. It was developed by Fred Davis in 1989 as an information systems theory. The theory tries to explain why people would choose to use a particular technology to better their life. Thus, the technology acceptance model states that two factors explain whether a new technology will be accepted by users: perceived usefulness and perceived ease of use. The first factor of perceived usefulness is about the prospective user's probability that using a specific technology or application will enhance the individual life performance. Basically, perceived usefulness is a factor that measures how useful a technology/application is to its users. The second factor of perceived ease of use centers on the degree to which the users expect the target technology to be free of effort.

Conversely, it is a factor to show how easily the user can use the technology. The technology acceptance model says very little about the technology itself; rather, the focus is what we believe or what we perceive this technology to be. Whether the technology is actually useful or actually easy to use is not a matter of the technology but a matter of our perceptions, and this may change obviously, so depending on how much experience you have, how old you are, what gender you are, the perceptions of a particular piece of technology say mobile device or a tablet computer changes not because the technology is different but because you and I are different. Therefore, this model was adopted in this paper because mobile technology satisfies the two factors of usefulness and ease of use, which implies that every financially excluded Nigerian could be onboard in the financial ecosystem through the use of mobile banking technology.

2.1.2. Financial Literacy Theory of Financial Inclusion

The theory states that financial literacy will expand the financially excluded individuals' willingness to onboard to the formal financial sector. This means that financial inclusion can be achieved through education that

increases the financial literacy of citizens [21]. When the financially excluded becomes literate financially, they will seek financial products and services where ever they can find them.

2.2. Empirical Review

Different studies have advanced that adopting the digital banking model has the potential to promote financial inclusion [2]. [19] show a positive correlation between financial inclusion and digital access to money. [22] also show a positive relationship between blockchain technology, financial inclusion and breaking out of the poverty cycle. [4] study in Africa found a positive significant relationship between financial inclusion and mobile phone penetration rates. Research by [10] in rural Peru reveals that mobile phone coverage expansion has reduced extreme poverty while increasing household consumption. [8] reports a negative relationship between mobile penetration and income inequality in a sample of 52 African countries. A similar study by [6] found that mobile, internet and broadband penetration positively impact inclusive growth, as measured by the inequality-adjusted human development index. [5] studied consumer attitudes towards mobile phone payments and found that adopting a new payment system is related to perceived security risks.

[25] study in Cambodia found that mobile phones have a positive impact on formal and informal borrowing. [12] works provided evidence of a positive association between the growth of mobile and internet and financial inclusion. [14] study of 41 developed and developing countries found a significant positive relationship between ICT indicators and financial inclusion. [17] his study found that mobile money, a byproduct of digital banking, has a positive impact on SME financial inclusion through its effects on increased access to bank credit. According to findings by [17], mobile ownership reduces the probability of a household falling into poverty in Ghana. [11] found that social networks and mobile money usage have a significant effect on financial inclusion in rural Uganda. [23] reached a similar conclusion that mobile phone penetration can promote financial inclusion. [15] used a sample of 49 countries for the periods 2014 -2016 to find a unidirectional causality from financial inclusion to mobile phones. [7] found a negative relationship between mobile, internet and broadband penetration and inequality in a panel of 48 African countries. Individual country studies provide further evidence of the positive development outcomes of Information and Communication Technologies (ICTs).

[22] conducted a study on mobile technologies, financial inclusion and inclusive growth in East Indonesia. The study finds that mobile technologies and access to finance significantly increase livelihood. [13] study with the help of a fixed effect panel data model of 41 countries found that information and communication technology positively determines financial inclusion. The result suggests further that both financial inclusion individually and once coupled with mobile and internet can improve the per capita growth. [2] results show that mobile banking technology adoption has lower performance for return on equity and non-performing loan of banks in Indonesia. [9] examine the impact of mobile phones and internet use on financial inclusion in EUpost–communist countries. The result indicates that mobile cellular phone and internet subscriptions positively affect financial institutions' access in countries like Hungary, Latvia, Lithuania, Poland and Slovenia and financial market access in Bulgaria, Croatia and Hungary. [10] investigated the contribution of digital financial services to financial inclusion in Mozambique using the Auto Regressive Distributed Lag (ARDL) model for the period from January 2011 to September 2019.

The study uses two models to analyze the contribution of digital financial services to financial inclusion measured by the number of bank accounts in Mozambique. The first model uses traditional digital means of payments as independent variables, such as the volume of financial transactions through Automated Teller Machines (ATMs), Point-of-Sales (POSs), electronic transfers of inter and interbank funds, direct debit, and domestic and cross-border remittances. The second model considers innovative digital means of payment, such as internet banking, mobile banking and electronic money. We conclude that, excluding domestic remittances and direct debit, which present low penetration levels in the country, and internet banking transactions, the

remaining variables contribute to financial inclusion. The results confirm the crucial role that digital financial services play in financial inclusion, particularly in improving access to and the use of services by the under-served population. [21] the paper investigates the effect of the digitalization of banking services on the Nigerian economy. Specifically, this was set out to find if specific digital banking service channels, such as the use of web pay and mobile pay, have an effect on the economy of Nigeria.

Twelve years of aggregate annual digital banking service data as provided by the Central Bank of Nigeria Statistical Bulletin was used in this study. A multiple regression procedure was used to determine the significance of the relationship between digital banking service channels and economic performance in Nigeria. The result shows that WEB Pay and Mobile Pay all exhibit a strong positive relationship with Nigeria's economic growth. This implies that the digitalization of banking service channels is strongly and significantly associated with economic growth in Nigeria. This further reveals that customers in Nigeria are embracing digital methods of banking. [20] examine the effect of mobile payment technology on poverty alleviation in Nigeria. The study was carried out in the Rivers State of Nigeria. The study population consisted of people living in the Rivers State of Nigeria. Both multistage and purposive sampling techniques were employed to obtain a sample size of 223 respondents for the study. A structured questionnaire served as the study's major data collection instrument.

The issue of validity and reliability of the research instrument was also addressed in the study. Data obtained from the field survey were first presented with simple descriptive statistics such as tables, frequencies, graphs and percentages. The data were tested with a simple regression model using the SPSS software version 25.0. Findings show that mobile payment technology was positively and significantly related to the consumption expenditure of the studied respondents in Rivers State of Nigeria. Based on the findings, the study concluded that embracing digital technology is a major tool in alleviating poverty, particularly in developing countries like Nigeria. Reviewing prior research, we have noticed that bulks of studies have focused mainly on developing economies from Asia to other African countries like Kenya, and results clearly indicate that the development of mobile technology contributes to increasing financial inclusion. As such, to the best of my knowledge, there are relatively limited studies on the effect of the digital banking model on expanding financial inclusion in Nigeria. Hence our main purpose was to investigate this link for a period of twelve (12) years from 2009 to 2021, using quarterly time series data.

3. Methodology

3.1. Data and Estimation Techniques

The research used the financial time series method to gather quarterly data. These secondary data were taken from the Central Bank of Nigeria Statistical Bulletin (2021) over a span of twelve (12) years, from 2009 to 2021. The independent variables consisted of quarterly time series data on the transaction volume of Automatic Teller Machines (ATMs), Point of Sale (POS) transactions, Web Banking Technology (WBT) transactions, and Mobile Banking Technology (MBT) transactions in Nigeria. To represent financial inclusion in Nigeria, the ratio of total deposit to Gross Domestic Product (GDP) was utilized as a proxy. The data were analyzed using the pairwise Granger causality test, a proven technique for forecasting one-time series with another. That is, it allows a researcher to pinpoint directional influences of variables on another without any a priori hypothesis regarding which variables are involved.

3.2. Model Specification

The functional relationship between digital banking technology and financial inclusion in Nigeria is modeled as follows;

$$RTD = f(POS, ATM, MOB\ WEB) \quad (1)$$

Because Equation 1 is a functional or linear equation in mathematical form, when transformed into an econometric equation, we have;

$$Rtd_{it} = \beta_1 atm_{it} + \beta_2 pos_{it} + \beta_3 mob_{it} + \beta_4 web_{it} + U \quad (2)$$

Where;

Rtd = Ratio of Total Deposit to Gross Domestic Product (a proxy for financial inclusion)
POS = Volume of Transactions on the Point of Sale in Nigeria
ATM = Volume of Transactions on Automated Teller Machine in Nigeria
MOB = Volume of Transactions on Mobile Banking in Nigeria
WEB = Volume of Transactions on Web Banking Technology in Nigeria
α = Constant or Intercept
$\beta 1 - \beta 4$ = Coefficient or Parameters
it = Time

4. Results and Discussion

Table 1. Pairwise granger causality test between digital banking technology and financial inclusion in Nigeria

Null Hypothesis:	Obs	F-Statistic	Prob.
POS does not Granger Cause RTD	43	1.53277	0.2229
RTD does not Granger Cause POS		1.64790	0.2066
ATM does not Granger Cause RTD	43	2.64860	0.1115
RTD does not Granger Cause ATM		6.53832	0.0145
MBT does not Granger Cause RTD	43	3.19623	0.0814
RTD does not Granger Cause MBT		0.03765	0.8471
WBT does not Granger Cause RTD	43	1.61620	0.2110
RTD does not Granger Cause WBT		2.75893	0.1045
ATM does not Granger Cause POS	43	0.86563	0.3577
POS does not Granger Cause ATM		8.30225	0.0063
MBT does not Granger Cause POS	43	0.01799	0.8940
POS does not Granger Cause MBT		0.20866	0.6503
WBT does not Granger Cause POS	43	2.58767	0.1156
POS does not Granger Cause WBT		11.8284	0.0014
MBT does not Granger Cause ATM	43	6.40909	0.0154
ATM does not Granger Cause MBT		0.93974	0.3382
WBT does not Granger Cause ATM	43	7.57691	0.0088
ATM does not Granger Cause WBT		4.86214	0.0333
WBT does not Granger Cause MBT	43	0.77293	0.3846
MBT does not Granger Cause WBT		4.08413	0.0500

Source: Extracted from E-view 9.0 output

Table 1 shows the granger causality between digital banking technology and financial inclusion in Nigeria. The result shows a unidirectional causality between financial inclusion and the number of ATMs. This implies that financial inclusion causes the number of ATMs to increase because an increase in the number of ATMs will make financial services more accessible to a broader range of people. This shows that more ATMs are positively correlated with higher financial inclusion.

Also, the result reveals a one-way causality exists between mobile banking transactions and financial inclusion in Nigeria. Meaning that mobile banking transaction causes financial inclusion because an increase in the use of mobile money technologies allows people to conduct financial transactions more efficiently, as they do not have to travel long distances to banks and exchange offices to carry out transactions. This indicates that the relationship between mobile banking technology and financial inclusion is positive. This indicates that the more people use mobile technology to conduct financial transactions, the higher the level of financial inclusion. However, this does not necessarily mean more people will use mobile technology to access financial services.

5. Conclusion

The paper empirically tests the effect of the digital banking model on financial inclusion in Nigeria. The study utilized a financial time series methodology to gather quarterly data. The secondary data were obtained from the Central Bank of Nigeria Statistical Bulletin (2021), covering a period of twelve (12) years from 2009 to 2021. The independent variables consisted of quarterly time series data on transaction volume for Automatic Teller Machines (ATM), Point of Sale (POS) systems, Web Banking Technology (WBT), and Mobile Banking Technology (MBT) in Nigeria. Financial inclusion in Nigeria was proxy by the total deposit ratio to gross domestic product. The data was analyzed using the pairwise granger causality test, a reliable method for determining if one-time series can forecast another. The paper found that the digital banking model significantly and critically influences Nigeria's financial inclusion.

Therefore, we conclude that despite the challenges faced by the banks in Nigeria, there is still great potential for incorporating more mobile and internet-based banking services into the banking system in order to improve financial inclusion in the country. This will further broaden the reach of banking services and ensure that more people are able to benefit from the services offered by these organizations. Banking services have become much more accessible in recent years thanks to technological advances and the development of innovative new delivery methods. This has been particularly evident in the case of mobile banking, where the use of smartphones and apps has helped to increase accessibility and convenience for both customers and service providers alike. Mobile banking is still a relatively new concept in Nigeria, which has hindered customers' and financial institutions' adoption of the technology. However, this has the potential to change in the future as more people become aware of the benefits and begin to take advantage of the services provided by this technology. Based on the findings of this study, the following recommendations are proffered.

i. Policymakers should encourage the development of affordable and accessible 3G and 4G mobile networks to provide rural and remote customers with better access to mobile banking and other financial technologies.
ii. The Central Bank of Nigeria should improve its supervisory and regulatory functions to ensure that commercial banks offer customers a wider variety of services, including mobile and internet-based banking and payment solutions.
iii. The government should put in place the necessary regulatory framework to encourage the growth and development of the financial sector in order to increase financial inclusion in the country.
iv. Banks should be encouraged to offer a wider range of mobile banking services to their customers in order to increase their usage rate and improve financial inclusion in the country.
v. In addition, bank employees should be trained to use the latest mobile technology to better interact with their customers and provide the best possible service.
vi. Finally, banks should seek to improve the financial literacy of their customer base by offering regular educational programmes on topics such as money management and financial planning.

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