

Signaling Channels of Financial Service Digitalization for Financial Inclusion in Nigeria

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Abstract

Drawing support from the technology diffusion theory and technology acceptance model, this study examined how financial service digitalization contributed to the process of financial inclusion in Nigeria. Three financial technologies, POS, ATM, and web payment services, were selected based on their dominance and availability to numerous bank customers in various locations, including rural areas. On the other hand, financial inclusion was measured by access to financial services, with a focus on the number of bank branches across Nigeria. An ex-post facto research design was followed with the application of the autoregressive distributed lag (ARDL) model to analyse the quarterly data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin. The findings showed that the POS and web payment services increased access to financial services and, in so doing, reduced the number of bank branches. This finding suggests that the availability of POS and web payment services is a prerequisite for financial inclusion while abridging the cost of banking transactions. In addition, it was found that ATM service is significant in promoting access to financial services. The implication of this finding is that increased availability of ATM service is associated with an increase in the number of bank branches, as most banks tend to situate their ATM galleries in their various branches for security and cost-effectiveness. In light of the findings, it is concluded that ATM technology is the most outstanding channel of finance service digitalization for financial inclusion in Nigeria. Thus, it is recommended that deposit money banks prioritise the provision of financial technology, especially ATMs, while scaling up their operational efficiency to create more opportunities for financial inclusion in Nigeria.

Keywords: Financial service, financial inclusion, digitalization, POS, ATM, web payment and financial technology

1. INTRODUCTION

Technology disruption in the Nigerian financial sector has evolved over time through the digitalization of financial services for improved service delivery. The digitalization process has expanded to automation of the financial sector and streamlining of digital transformation to

foster seamless financial service delivery and improved financial inclusion over time. According to Mogaji (2020), financial policies, technology and education are essential for overcoming the barriers to financial inclusion. This is grounded on the understanding that financial technology has the potential to open doors for financial inclusion, enabling people to engage in financial activities regardless of their location or social standing. Notably, the Central Bank of Nigeria (CBN) introduced the Payment Systems Vision 2020 (PSV2020) in 2007 geared towards transitioning Nigeria's cash-dominated economy to a cashless economy and creating a pathway for increased economic activity by providing a safe and efficient mechanism for making and receiving payments with minimum risks. In order to increase opportunities for the growth and modernization of Nigeria's payment system, encourage cost-effective banking service delivery, and advance the process of financial inclusion, the CBN then introduced the cashless policy in 2012.

Ene, Abba and Fatokun (2019) argue that the cash-less policy has revolutionized the digitalization of banking services considering the increasing number of automated teller machines, point-of-sales facilities, internet banking and mobile banking among others. There is also growing recognition of the imperative of digital banking and financial inclusion for poverty economic growth and poverty reduction among policymakers, academics and other relevant stakeholders in the financial sector. Aziz *et al.* (2021) are of the view that financial inclusion is driven by the provision of digital banking. Similarly, Hyun-Soo Choi (2020) explains that the adoption of adoption digital banking is essential for transforming the banking industry in achieving financial inclusion with greater access to financial services and products other than the usual traditional banking.

In addition, Oteh, Ibok and Nto (2017) posit that electronic banking channels enabled by technological innovation are essential for financial inclusion by providing the opportunity of reaching a wider spectrum of the population in need of banking services. In other words, it is expected to offer a veritable platform for addressing the prevalence of financial exclusion through technology-enabled e-banking channels. However, the extent to which the channels of financial service digitalization create an opportunity for financial inclusion has remained a source of concern to monetary authorities and other key players in the Nigerian economy. Thus, there has been renewed interest in both policy and academic circles on whether the digitalization of financial services has effectively or ineffectively played a catalytic role in boosting financial inclusion. This has triggered controversies which have necessitated research in this direction. Therefore, this study seeks to examine how the channels of financial service digitalization drive the process of financial inclusion in Nigeria between 2010 and 2020.

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical Literature

Rogers (1962) developed the technology diffusion theory which highlighted four drivers of innovation spread to include innovation itself, time, and social system and communication channels. The theory is based on the assumption that five characteristics of technology innovation that determine its adoption by the target users include relative advantage, compatibility, complexity, trial-ability and observable results. Tan and Teo (2000) describe relative advantage as core the driver of customer's choice of electronic banking. As an attribute

of innovation, complexity defines the degree the potential users of a particular technology perceive it as difficult to understand and use. Innovations with easy understanding are more rapidly embraced by potential users than those that require difficult understandings and technicalities (Robinson, 2009). Trial ability involves the extent an innovation allows potential users to experiment with it before taking a decision on whether it can be adopted. However, Bayer and Melone (1989) posit that the technology innovation theory poses a challenge in forecasting the adoption of technological innovation.

In addition, Davis (1989) and Davis, Bagozzi and Warsaw (1989) proposed the technology acceptance model (TAM) as an extension of Ajzen and Fishbein (1980) theory of reasoned action. It is the most notable model that offers insight into how users accept and use technology. TAM is very useful in explaining and forecasting users' behaviour with regard to information technology. It also serves as a starting point for determining the influence of external factors on the target users' beliefs, attitudes, and intentions to adopt information technology. Davis (1989), who emphasised the effectiveness of TAM, claims that it provides a tremendous chance for tracing how consumers' perceptions of the usefulness, ease of use, and attitude toward the use of a given technology influence its final utilisation. More generally, TAM presupposes that a user's decision to utilise a technological system is a direct or indirect result of the user's personality, perception of or knowledge of the system's utility, behavioural intentions, and anticipated ease of use of the system (Park, 2003). It is significant that TAM has been cited in research as the model that is most frequently used to examine how the target users adopt and use technology. With the birth of TAM-2, a development of the original concept, it has changed through time.

2.2 Empirical Literature

The influence of electronic banking on financial inclusion in Nigeria was examined by Ene, Abba, and Fatokun (2019). The study employed the proportion of banked adults to the total bankable adult population in Nigeria as a proxy for financial inclusion and the total number of automated teller machines and point-of-sale devices in Nigeria as proxies for electronic banking. The study used computer-based multiple regression analysis and employed correlational and ex-post facto research designs. The impact of point-of-sale devices on financial inclusion in Nigeria was shown to be greater than that of automated teller machines in that country. The results showed that the impact of point-of-sale devices on financial inclusion in Nigeria was shown to be greater than that of automated teller machines in Nigeria. Thus, the study recommended that deposit money institutions should eliminate obstacles to using their automated teller machines and work to adhere to international best practices. It is also suggested that POS equipment should also be conveniently accessible to customers and readily available.

Asare and Sakoe (2015) used qualitative research techniques to investigate the impact of financial technology on financial services in Ghana. According to the study, the introduction of financial technology in Ghana has improved access to a wide range of banking products. Additionally, the delivery of banking services has become faster to serve a larger client base or those who have been referred by current customers. As a result, the study came to the conclusion that financial technology has fundamentally transformed the banking industry in Ghana, transforming it from a financial middleman to a financial shopping mall that offers a one-stop shop for numerous financial services.

In a related study, Oumarou and Celestin (2021) investigated the factors that influence financial inclusion in Eight West African Economic and Monetary Union (WAEMU) members from 2004 to 2017. They examined a variety of digital finance metrics, such as interbank credit transfers and the prevalence of mobile phones. On the chosen variables, they applied panel ordinary least squares and generalised least squares approaches. Their findings demonstrated how mobile money transfers underpinning digital finances significantly and favourably boosted financial inclusion in the WAEMU countries. The study also showed that this beneficial impact is evident in the region's increase in financial inclusion, which increased by more than 50% in just 10 years, from 2005 to 2015.

Mago and Chitokwindo (2014) focused on mobile banking in the province of Masvingo as they investigated the effect of financial technology on financial inclusion in Zimbabwe. The study used a survey design and a qualitative research approach. They contend that Zimbabwe's financial inclusion is strongly impacted by electronic banking. Their findings demonstrate that low-income individuals are open to using mobile banking, which will increase financial inclusion. They contend in this manner because internet banking is simple to use, convenient, affordable, and secure. Although they used a valid approach, it might be said that their study's scope is too little because they only understudied one area rather than the entire nation, which would have led to a more thorough review.

Asuquo and Ezekwe (2017) evaluated the effect of electronic banking services on consumers' satisfaction in a few deposit money banks in Rivers State, Nigeria. Four (4) systematically important (Too Big to Fail) banks and eight (8) national banks were used with 300 copies of questionnaires distributed to collect the necessary data from customers and employees. The information acquired was primarily focused on the socioeconomic characteristics of the respondents, the types and nature of consumer complaints about electronic banking, and other issues that affect how well electronic banking services are implemented, according to bank staff. As a method for data analysis, a combination of descriptive and inferential statistics was used. The results show that consumers' concerns about electronic banking include the ATMs debiting their accounts without their permission, the ATMs not having any cash available, the resolution of problems involving electronic banking goods, and the ATMs trapping their cards. Along with the complaints of the clients, it was also discovered that the bank employees cited network failure, a lack of staff, improper management of the naira note, and the CBN's directive on stuck cards as other significant obstacles to the successful adoption of electronic banking services. In order to satisfy customers' needs, the study recommended that deposit money banks should give top priority to access to the enhanced network via a maximum link-up time and regular reviews of the cash withdrawal and transaction restrictions on the e-channels.

David, Oluseyi and Emmanuel (2018) utilized time series data for the period 1990-2016 to examine the factors influencing financial inclusion in Nigeria. The unit root tests and cointegration tests were followed by the use of an Error Correction Model (ECM) in the study. The calculated outcome showed a favourable and substantial correlation between the postulated factors and financial inclusion. Particularly, the degree of financial inclusion in a nation's financial system increases with its per-capita GDP. Similar to broad money, which will increase financial inclusion in the country given the ongoing expansion in the amount of money in circulation, the percentage of people who utilise credit and the internet also significantly and

favourably affected financial inclusion. The results further showed that the internet has fundamentally abridged the cost of transactions through the use of mobile phones and ATMs. This has increased the capacity of credit delivery in remote areas of the country and has made it possible to provide home banking services where the accounts are operated by illiterate customers using mobile phones.

3. MATERIALS AND METHODS

3.1 Variable Description

In this paper, a broader measure of financial service digitalization was employed. Specifically, three financial technologies, POS, ATM, and web payment services, were selected based on their dominance and availability to numerous bank customers in various locations, including rural areas. The naira value of the POS, ATM, and web payment transactions as documented in the CBN Statistical Bulletin served as the data for financial service digitalization. In addition, financial inclusion was measured by access to financial services, with a focus on the number of bank branches in Nigeria.

3.2 Data Analysis Techniques

This study employs the autoregressive distributed lag (ARDL) model to analyse the quarterly data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin. This is based on its built-in advantages and the time series properties of the variables of interest. The notational terms of the ARDL as provided by Pesaran and Shin (1999) take the form of ARDL (p, q), where p denotes the number of lags of the dependent variable and q represents the number of lags of the independent variable(s). Specifically, the ARDL model setup for this study is provided as follows:

$$\begin{aligned}
 FINC_t = & \alpha_0 + \sum_{i=1}^p \psi_{1i} \Delta FINC_{t-1} + \sum_{i=1}^q \psi_{2i} \Delta POS_{t-1} + \sum_{i=1}^q \psi_{3i} \Delta ATM_{t-1} + \sum_{i=1}^q \psi_{4i} \Delta WEB_{t-1} + \beta_1 FINC_{t-1} \\
 & + \beta_2 POS_{t-1} + \beta_3 ATM_{t-1} + \beta_4 WEB_{t-1} + e_t
 \end{aligned} \tag{1}$$

Where: FINC = Financial inclusion (measured by financial service access as described above), WEB = web payment, Where: α_0 = constant term, $\psi_1 - \psi_4$ = short-run coefficients of the predictor variables, $\beta_1 - \beta_4$ = long run multipliers e_t = error term, Δ = first difference notation p and q = number of lags for the dependent and independent variables respectively.

The ARDL requires fractionally integrated variables of orders zero and one, with restrictions for variables integrated of order two. In addition, a preliminary investigation of the time series data was conducted using the augmented Dickey-Fuller unit root test method to determine their respective order of integration. This study also followed the bounds method of cointegration as embodied in the ARDL model to test for evidence of long-run relationships among the series.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The descriptive statistics for each series, such as mean, standard deviation, normal distribution, and minimum and maximum values are presented in Table 1.

Table: Summary statistics for the series

	FINC	WEB	ATM	POS
Mean	5533.545	3166.270	452.2552	110.1118
Median	5526.000	8.225000	363.0400	39.51500
Maximum	5809.000	46645.99	1754.260	574.3700
Minimum	5301.000	1.330000	25.33000	0.910000
Std. Dev.	142.3075	10324.78	407.7713	140.1028
Kurtosis	2.436583	11.32642	6.435986	4.444156
Jarque-Bera	1.445957	197.9796	49.82951	19.48787
Probability	0.485305	0.000000	0.000000	0.000059
Observations	44	44	44	44

Source: Authors' computation (2022)

The summary statistics reported in Table 1 showed that financial inclusion (measured by the number of bank branches) averaged 5533.545, with minimum and maximum values of 5301.000 and 5809.000, respectively. This suggests that there are growing efforts towards improving the level of financial inclusion across Nigeria through the availability of banking services at various locations. The mean distribution for financial service digitalization shows that web payment averaged 3166.270, while ATM and POS services averaged 452.2552 and 110.1118, respectively. This suggests that web payment services dominated financial service digitalization during the study period, which could be attributed to their convenience and preference among bank customers, especially the technologically informed group. The standard deviation showed that the observations of all the series except POS technology clustered around their respective means. It was evident from the kurtosis that web payment, ATM, and POS services are leptokurtic as their calculated kurtosis values significantly exceed 3. However, the number of bank branches was found to be platykurtic given its calculated kurtosis of 2.4365, which is less than 3. The probability of the Jarque-Bera statistics revealed that only the number of bank branches is normally distributed at a 5 percent significance level. However, the financial service digitalization measures (web payment, ATM, and POS services) were not normally distributed.

4.2 Stationary test

The preliminary investigation into the time series data was conducted via a stationarity test. The results are reported in Table 2.

Table 2: Summary of the stationarity test results

Variable	ADF statistics @ levels	ADF statistics @ 1 st difference	Order of integration
LOG(FINC)	-1.701 (0.7294)	-4.201 (0.0111)	I(1)
LOG(WEB)	-0.639 (0.9711)	-7.912 (0.0000)	I(1)
LOG(ATM)	-3.286 (0.0822)	-6.911 (0.0000)	I(1)
LOG(POS)			

Source: Authors' computation (2022)

Note: Figures in parenthesis denote the corresponding probability values of ADF statistics

The results revealed that POS service is stationary at current levels because its ADF statistic is associated with a probability value that is less than 0.05. Hence, the null hypothesis of unit root is rejected at the 5 percent significance level. Because of the evidence of stationary at levels, the POS service is integrated of order zero, I(0). The results further revealed that the number of bank branches, web payment services, and ATM services is not stationary at current levels, given that the probability values of their respective ADF statistics are less than 0.05. However, the non-stationary series were found to be stationary at the first difference, which suggests that they are all integrated of order one, I(1). Overall, the stationarity test results revealed that the variables are mixed-integrated, which prompted the test for cointegration using the bounds test method.

4.3 Bounds Cointegration test

The results of the bounds cointegration are reported in Table 3.

Table 3: Summary of the test results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance level	I(0)	I(1)
F-statistic	6.013	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: Authors' computation (2022)

Note: K denotes the number of explanatory variables

The results showed that the variables are cointegrated at a 5% level of significance. This is due to the fact that the calculated F-statistic (6.013) exceeds the upper bound critical value (3.67). This result provided the required empirical evidence to reject the null hypothesis that there was no long-run relationship among the variables over the study period. The evidence of cointegration among the variables aligns with the findings of David, Oluseyi and Emmanuel (2018) which highlighted that financial inclusion is cointegrated with its determinants.

4.4 Estimation of the ARDL Model

The ARDL-ECM and long-run results are presented in Table 4.

Table 4: Summary of the ARDL results

ARDL Long-run Results				
Dependent Variable: DLOG(FINC)				
Sample: 2010Q1 2020Q4				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(WEB)	-0.008742***	0.002977	-2.936475	0.0062
LOG(ATM)	0.060632***	0.024047	2.521408	0.0170
LOG(POS)	-0.017907***	0.006693	-2.675353	0.0118

C	8.349392***	0.112432	74.26186	0.0000
ARDL Error Correction (ECM) Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(FINC(-1))	0.257839**	0.121143	2.128379	0.0414
DLOG(ATM)	0.031800***	0.012052	2.638615	0.0129
CointEq(-1)*	-0.722659***	0.124033	-5.826365	0.0000
R-squared	0.548949	Mean dependent var		-0.001895
Adjusted R-squared	0.497400	S.D. dependent var		0.017735
S.E. of regression	0.012573	Akaike info criterion		-5.798045
Sum squared resid	0.005533	Schwarz criterion		-5.586935
Log likelihood	120.9609	Hannan-Quinn criter.		-5.721714
Durbin-Watson stat	1.729903			

Source: Authors' computation (2022)

Note: *** and ** denotes statistically significant at 1% and 5% levels respectively

The results showed that web payment services have a negative and significant effect on the number of bank branches in the long run. With a 1 percent increase in web payment service, the number of bank branches was reduced by 0.0087 percent. The implication of this finding is that an increase in web payment services increases convenient and easy access to financial services and, in so doing, promotes the extent of financial inclusion in the country. This finding is in accordance with the results of Asare and Sakoe (2015), which revealed that the introduction of financial technology in Ghana has improved access to a wide range of banking products with great potential for financial inclusion. At the same time, evidence of a negative and significant effect of POS service on the number of bank branches was established in the long run. This finding is impressive as it reveals that the availability of POS has reduced the establishment of bank branches given that it offers opportunities for increased access to financial services, especially in rural and underserved areas across Nigeria. The number of bank branches was reduced by 0.0179 percent following a 1 percent increase in the availability of POS service. This finding indicates that the POS service facilitates financial inclusion by promoting access to financial services.

In comparison, this finding authenticated the results of Ene, Abba, and Fatokun (2019), which highlighted the important contributions of POS devices to financial inclusion as they seem to be conveniently and readily available to bank customers in Nigeria. However, it was found that the effect of ATM service on the number of bank branches is positive and significant in both the short and long run. This finding supported the work of David, Oluseyi and Emmanuel (2018); Asuquo and Ezekwe (2017), which highlighted the imperativeness of ATM devices in promoting the inclusiveness of the financial services. The implication of this finding is that increased availability of ATM service increases the number of bank branches as most banks tend to situate their ATM gallery in their various branches which ensures the security of the ATMs and reduces the operation cost. The ARDL ECM results showed that the model can adjust to from short-run to long-run equilibrium position at a speed of 72.2 percent. This finding further authenticates the evidence of cointegration among the variables at the conventional 5 percent significance level.

Table 5: Post-estimation diagnostics tests results

Test type/Null Hypothesis (H_0)	Test-statistic	Prob. Value	Decision
Breusch-Godfrey Serial Correlation test H_0 :No serial correlation in residuals	Chi-square stat. (4.591)	0.1007	Accept H_0
Breusch-Pagan-Godfrey heteroscedasticity test H_0 :Residuals are homoscedastic	Chi-square stat. (13.70)	0.0899	Accept H_0

Source: Authors' computation (2022)

The Breusch-Godfrey LM Test for serial correlation was conducted to determine if there is a serial correlation in the residuals. From the results, the Chi-square statistic (4.591) is associated with a probability value of 0.1007, which is greater than 0.05. This finding necessitated the rejection of the acceptance of the null hypothesis of no serial correlation in the residuals. In other words, the residuals are serially independent at 5 percent level. Similarly, the Breusch-Pagan-Godfrey heteroscedasticity test result showed that the probability value (0.0899) of the chi-square statistic (13.70) is greater than 0.05. This finding suggests that the variance of the residuals is constant over time. In sum, the residual diagnostics test results, especially the serial correlation and heteroscedasticity results authenticated the reliability of the model for policy prescription.

5. Conclusion

This paper draws support from the technology diffusion theory and technology acceptance model to examine how financial service digitalization contributed to the process of financial inclusion in Nigeria. This was based on the growing interest in understanding how the digital transformation of the Nigerian financial system, especially the banking sub-sector, has fostered seamless financial service delivery. Three financial technologies, POS, ATM and web payment services were selected based on their dominance and availability to numerous bank customers in various locations, including rural areas. The findings showed that the availability of POS and web payment services increased access to financial services and, in so doing, reduced the number of bank branches, which has the potential to reduce the cost of transactions. Furthermore, the findings revealed that ATM devices increased the population's access to financial services significantly. In light of the findings, this paper concludes that the availability of ATM services is the most outstanding channel of finance service digitalization for financial inclusion in Nigeria. It is also concluded that POS service is next to ATM technology in promoting the process of financial inclusion, as it surpassed web payment service by significantly reducing the number of bank branches across the country, and every location in rural and urban areas is gradually witnessing the increasing presence of POS operators. To this end, this paper recommends that deposit money banks prioritise the provision of financial technology, especially ATM and POS services while scaling up their operational efficiency to create more opportunities for financial inclusion. Again, deposit money banks should synergize with internet providers to boost the efficiency of internet banking transactions for improved service delivery and financial inclusion.

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