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IMPACT OF DIGITAL FINANCIAL SERVICES ON SAVINGS DEVELOPMENT IN NIGERIA

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Abstract

This study examines the impact of digital financial services (DFS) on savings development in Nigeria, from 2009 to 2021, using the autoregressive distributed lag (ARDL) method. A phenomenon in the annals of Nigeria's financial system, is the funding-gap to meeting her development needs, evidenced in rising interest rates, increasing budget deficit, failure of national development plans, etc, which this study attributes to lack of digital savings facilities. The findings revealed that in the long-run, automated teller machine (ATM) has positive effect on total savings (TS) while web transfer (WT), mobile transfer (MT), and point of sales (POS) have negative long-run effect on TS. It implies that, in the long-run, ATM may develop savings potency of the saver, perhaps by technological instinct and capacity. The study upholds the technology acceptance theory, that digital technology may develop savings in Nigeria. Based on these findings, the Central Bank of Nigeria needs to create an enabling environment and policies to encourage the innovation of more digital savings platforms to diversify and increase savings. Financial institutions should design user-friendly interfaces that could facilitate savings and educate bank service consumers about the benefits of using ATM savings platform. Fiscal incentives should be provided to boost savings via ATM. Further studies on savings development are suggested to apply different methods to test the potency of all digital platforms.

Keywords: Digital financial services, Nigeria, Savings development

JEL Code: G23, N27, G51

1. Introduction

The financial services sector has contributed in no small way to Nigeria having the largest economy in Africa. Over time, the sector has witnessed increased transformations. Digital financial services are among the technological advancements that the financial sector of developing economies has experienced. According to World Bank (2020) report, Digital financial services (DFS) are types of financial products that are delivered to customers using digital technologies. However, financial products and services, such as payments, transfers, savings, credit, insurance, securities, financial planning, and account statements, are referred to as digital financial services (DFS). Examples of such products and services include payment cards, regular bank accounts, e-money (which can be initiated online or on a mobile device), and financial securities. Participating in the delivery of DFS requires the engagement of several parties, including banks and other financial institutions, mobile network carriers, regulators, financial technology companies, agents, retailers, and customers (Ekocha, Ugwuanyi, & Ekocha, 2023). Digital financial services (DFS) embraces making of payments and deposits through bank cards, online money transfers, or mobile phones among others (Gbanador, 2023). Therefore, this study focuses on digital financial transfers and payments meant for savings purposes.

According to Financial Sector Deepening Africa (FSDA, 2022) report, evidence suggests that connecting savings groups to formal financial institutions has a number of advantages, firstly, improved fund safety for the group, secondly, improved financial performance, especially for groups that can access larger credit facilities to on-lend within groups, and thirdly, the ability to save for longer than one cycle since groups typically have to start from scratch after each cycle. Savings provide the funds necessary for investments and this has a significant positive impact on economic growth (Mbutia & Ndiritu, 2020).

Savings is an income that is not immediately consumed. In the household budget system, savings function is of residual consideration to consumption function (Olofin, 2001). Therefore, in line with the Keynes' general equilibrium conditions, investment and savings equilibrium condition must hold simultaneously, which would require the need for a developmental model that raises the required quantity of savings to meet the target level of investment. This development principle is explained in the second- best theory.

People save for a variety of reasons, such as setting money aside for emergencies and preparing for large purchases in the future, among others. The future is also out of our control, therefore, saving some money to use when necessary is essentially organizing and accepting responsibility for one's financial and economic worries. Savings can be accomplished in a variety of methods, especially in remote regions where majority of the population earn low incomes and have no formal education. Rural residents save using items that can be easily converted to currency, such as grains, livestock, clothing, ornaments, and other items, as opposed to the usual method of saving through financial assets (Odejimi, & Edogiawerie, 2019).

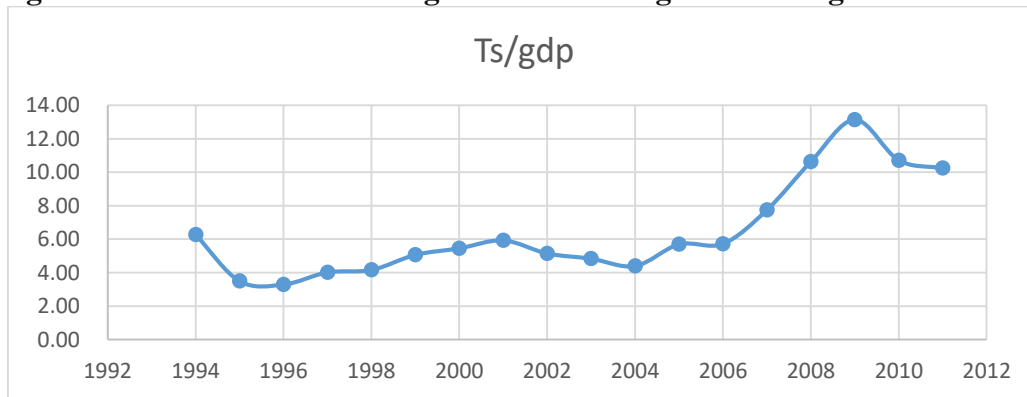
DFS raise savings rates and total amounts saved, especially among the poor. However, the benefits of saving have not been as numerous as those of payments and credit. (Haider, 2018). According to empirical data from Kenya, people who use mobile financial services are more likely to save than those who do otherwise, and they are also more likely to save more (Ouma, Odongo, & Were, 2017). Savings are advantageous to DFS providers as well as its customers. Customers who use DFS accounts to save money can increase their financial resilience, build a hedge against income shocks, and be in a better position to invest and take part in strategic financial planning. Financial Service Providers (FSP) with more savers in their portfolio might profit by increasing income and decreasing their cost of funds (Buri & Reitzug, 2019). Electronic devices and information technology are crucial to achieving long-term financial improvement and overall economic development.

In Nigeria, using automated teller machines and mobile money to pay for services, goods, wages, utilities, and government cash transfers is quickly becoming a common practise. Considering the significance of savings for protecting the welfare of people and households during difficult times and the expanding usage of digital payment platforms, it is crucial to investigate the relationship between savings levels and digital payment technology (Akinrinola, Omojola & Audu, 2023).

One cannot overstate how important savings are to a nation's economic development. Due to shortage of cash to support investment, the economies of poor countries expand at a very slow rate. The cost of capital is typically high and discourages investors since banks find it difficult to offer substantial loans to prospective investors with their meagre savings. A relatively high deposit interest rate is necessary to successfully mobilize savings in an economy, meaning that savings must have a higher opportunity cost than the immediate pleasure from current consumption. There is no doubt that an economy's amount of savings affects its level of investment. If a country wants to prosper economically, national savings

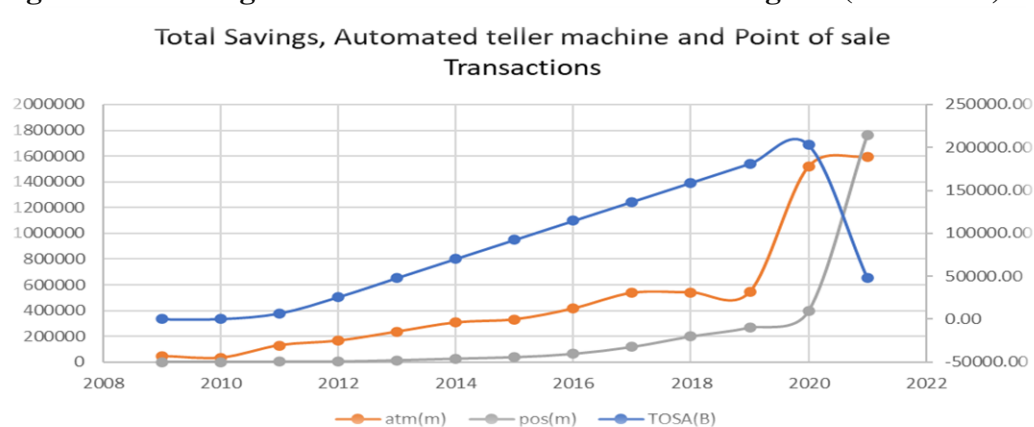
are just as important as individual savings (Odejimi & Edo, 2019). It is impossible to overstate the benefits of household saving. Savings have implications for foreign exchange and lessens the need to look for international credits. It provides motivation and optimism to foreign investors who can expand their companies through local funds mobilization. Savings may constitute a withdrawal from the economy, but when they are returned through investments, the multiplier effects can be enormous (Tella, 2023). According to money market indicators figures from the Central Bank of Nigeria (CBN), banks' savings deposit rates increased slightly to 5.24 percent in July from 5.18 percent and 5.13 percent in June and May respectively (CBN, 2023). This is expected to encourage Nigerians to increase savings.

Fig 1: The nexus between savings and economic growth in Nigeria



Source: CBN, 2023

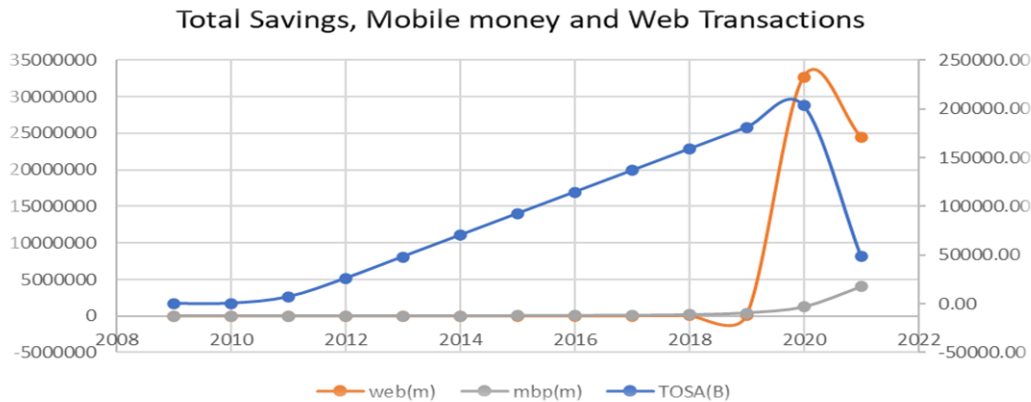
Fig 2: Facts on Digital financial services Indicators in Nigeria (2009-2021)



Source: CBN, 2023

The use of Automated Teller Machine (ATM) in Nigeria has consistently grown over the years. In 2009, ATM transactions were valued at 45.716 million naira, and rose to 1.59 billion naira in 2021. This shift signifies a strong move towards electronic transactions and a greater reliance on ATMs for financial activities in the Nigerian economy. Meanwhile, the savings (TS) in the financial sector have steadily increased as well, with 19.52 billion naira in 2009 and peaking at about 203.26 billion naira in 2020. There was a drop to 48.64 billion naira in 2021. Meanwhile, point of sale (POS) transactions also experienced an upward trend over the years with 919.17 million naira in 2009. These values increased to 1.76 billion naira by 2021. This trend highlights a substantial shift to digital transaction methods and an increased adoption of POS systems. However, in 2021, while POS transactions rose, total savings decreased, indicating a shift in financial behaviors.

Fig 3: Total savings (TS), Mobile transfer (MT) and WEB transactions (WT)



Source: CBN, 2023

Over the years, the financial sector has seen remarkable growth in total savings (TS), with 19.52 billion naira in 2009 and peaking at 203.26 billion naira in 2020. However, there was a downward trend to 48.64 billion naira in 2021. Despite the decline in 2021, the overall trend points towards positive savings growth. Similarly, web-based transactions (WT) have experienced an upward trend, reaching 7,012.5-million-naira value in 2009 and 24.48 billion naira in 2021. This shift highlights a significant move towards digital transactions and increased reliance on online platforms for financial activities. Additionally, mobile transfers (MT) displayed fluctuation within the period under review with the value increasing from 105.83 million naira in 2009 to an impressive 4,019,429.83 million naira in 2021. This substantial rise suggests noteworthy advancements in the financial sector.

Savings are crucial because they help to protect against shocks and balance out spending over time, in addition to serving as a source of capital for business expansion and investment (Buvinić, Johnson, Perova, & Witoelar, 2020). However, savings development in Nigeria has been very low. The revolution in the digital world through digitalization of savings is of immense benefit because it is expected to reduce cost and bring in a new flare into savings development. According to Tella (2023), savings has been low for many reasons which include low national income and wages, irregular payment of salaries and non-remittance of cooperative savings to cooperatives. Currently, CBN figures reveal a wide margin of 22.14 percent between the maximum lending rate (27.38%) and savings deposit rate (5.24%). To boost financial inclusion and expand access to finance, digital technology is not enough on its own (Ozili, 2018). A robust physical infrastructure, suitable rules and consumer safeguards, awareness of and trust in digital channels, among other things, are required to ensure that consumers can access and profit from digital financial services. Additionally, it is crucial to cater these services to the requirements of underserved populations, such as women, the poor, and first-time customers of financial services who may not possess strong literacy and numeracy abilities. The adoption of DFS could be hampered by not paying attention to these elements and needs. (Haider 2018). However, enhancing the availability of bank accounts, alternative delivery channels like digital finance, and connecting unofficial savings organisations with official financial institutions can enhance savings services (Simatele, 2021).

Several studies have been carried out on digital financial services and their impact on savings in Africa (Loaba, 2021; Mbuthia & Ndiritu, 2020; Ouma, Odongo & Were, 2017; amongst others). However, only few literatures have focused on Nigeria (Akinrinola, Omojola, & Audu, 2023; Ekocha, Ugwuanyi, & Ekocha, 2023) and to the best of the researcher's knowledge, none has considered the impact of digital financial services on savings development, Akinrinola et al., 2023 and Ekocha et al., 2020 used household savings and money supply respectively, this forms a gap in this study. This study aims to close this gap by investigating the impact of digital financial services (DFS) on savings development in Nigeria.

The main objective of this study is to ascertain the impact of DFS on savings development in Nigeria using ATM, MT, POS, and WT as proxies. The following research question is formulated to guide this study: Why is DFS strategic to savings development and to what extent has ATM, MT, POS, and WT improved savings development in Nigeria? Therefore, the hypothesis formulated for this study is that DFS has not significantly improved savings development in Nigeria. Therefore, this

study looks at the relationship between DFS and savings development in Nigeria. According to World Bank report, Nigeria is a significant regional player in West Africa accounting for almost half of West Africa's population with approximately 220 million people and has the largest population of youth in Africa.

The study covers the period 2009 to 2021 due to the availability of data to provide enough observation for dynamic analytics. The remaining section of this paper is structured as follows: The literature review and gap in the literature are presented in section two (2). Materials and methods are discussed in section three (3). The study's findings are discussed in section four (4) while the conclusion and recommendations are presented in section five (5).

2. Theoretical Review

Digital Financial Services: DFS are financial services that combine various digital technologies to accelerate financial transactions. According to Rashid (2020) DFS is a term for a group of financial products that are both affordable and help to fight poverty. Fintech, which makes it possible, helps to reach rural poor people more easily and at lower prices while also being accurate, quick, and transparent. World Bank Group (2020) report defined DFS as financial services which depend on digital technologies for their distribution and utilization by clients. The ease that digital banking provides to people with low and unpredictable earnings may be more significant to them than the additional fees they incur to get such services from traditional controlled banking institutions (Ozili, 2018).

Automated Teller Machine (ATM): These are transactions made using ATM which are self-service machines that allow customers to perform various banking transactions without visiting a bank branch. ATMs provide services such as cash withdrawals, balance inquiries, fund transfers, and bill payments. Cash withdrawals from bank accounts are done using ATMs. Additionally, they have recently been improved to now accept cash deposits or savings into bank accounts.

Mobile transfer (MT): These are transactions made using Mobile transfer platforms. Mobile transfer platforms refer to financial services that allow individuals to conduct monetary transactions using mobile devices, such as smartphones. Users may utilize mobile applications or USSD codes to access additional banking services, make payments, and transfer money. Mobile transfer services are a crucial part of digital financial services as they offer a simple and accessible platform for digital transactions. (GSMA, 2021).

Point of Sales (POS): A point-of-sale system enables customers to complete payments for goods and services via point-of-sale terminals and other devices.

Web Transfers (WT): Web Transfer services, commonly referred to as electronic payment systems or online payment systems, enable users to conduct financial transactions via the internet or in an online setting.

Savings raises the country's capital stock, which boosts productivity and raises living standards as a result. Investments are not always equivalent to national savings in each country because capital is mobile internationally (Fredriksson & Staal, 2022). Savings development is a revolution in the financial system that explains how savings may grow and perform over time.

Individuals and families in advanced countries have readily available access to credit since they can use their credit cards to overdraw without making an official application; this may reduce the necessity for saving. Contrarily, access to credit is sometimes more difficult in developing nations, particularly for those with low incomes, leading them to turn to local loan sharks for financing. People would rather forego present consumption in favour of saving for the future since loan sharks receive high rates of interest (Odejimi & Edogiawerie, 2019).

Rodriguez and Conrad (2018) in their study found out that most institutions implemented an agent channel because of a strategic decision to mobilise savings. They also suggested that banking institutions can make use of intermediation or use a less expensive source of funds to support lending activities, by mobilising deposits and profiting from the gap between the lending and savings interest rates. Financial estimates that consider the lower funding expenses brought on by savings in the middleman process can improve profitability and, as a result, the viability of a digital service. Furthermore, based on the study's findings, two institutions monitored the number of cash-ins for savings. During the duration of the investigation, one institution did not notice any corresponding growth in savings for users of agent banking. The other, on the other hand, reported a good level of savings mobilisation through the agent channel, doubling the amount of savings mobilised through the channel between January and December 2017 (Rodriguez & Conrad, 2018).

Several theories attempt to elucidate the influence of digital financial services and the level of savings. Four theories considered relevant to this study were reviewed to explain the relationship between digital financial services and savings

development in Nigeria. However, the study is anchored on Technology Acceptance Theory. In the neoclassical thought, technology is the basic language of rapid development. Technology acceptance theory (Davies, 1985) explains the acceptance and usage of a new technology. According to Akinrinola, Omojola, and Audu (2023), it is safe to say that the usefulness of a financial technology is determined by the effectiveness of the payment channels and instruments in the user's financial interactions with others. When compared with the existing payment methods, if the proposed technology is not considered effective or more effective, the users would rather not accept it. This theory basically explains the conditions that will make a user accept a new technology to ease job performance (Aielemen, Enobong, Osuma, Evbuomwan, & Ndigwe, 2018). Therefore, savings development may require discovery and innovativeness in digital savings instruments that could make savings more attractive and hence significantly improve the capacity and capability of the individual, corporate saver, and government.

Furthermore, for an economy in need of higher investment level for higher growth rate like Nigeria, the theory of second-best (Lipsey and Lancaster, 1957) may be applicable via savings development. The equilibrium of investment and saving function are critical to a desired level of output and employment. As earlier explained, the second-best theory reveals that every economic model such as the equilibrium level of output is a function of simultaneous equilibrium of the system's components, such that, should any of the components fail to equilibrate, what may result is a second-best equilibrium condition, which may be suboptimal.

Diffusion of Innovation Theory: Since the introduction of digital financial services can be linked to advancements in mobile technology and information technology, it is safe to assume that continued advancements in technologically assisted payment systems will increase society's acceptance of digital financial transactions (Rogers, 1962). Also, the theory explains the spread and acceptance of new innovations by its users. This further highlights the specific needs of each user group, identify, and integrates it and offer inclusive technology to suit the various customer groups.

Theory of Financial Innovations: The financial innovation theory propounded by Silber (1983) stated that the primary reason for a firm to embrace financial innovation is to strengthen its financial position. Recent reforms, particularly the COVID-19 pandemic, have had a significant impact on financial markets around the world. For many years, the growth of international financial markets has been

dependent on the implementation of financial innovations. These developments have given rise to new financial instruments, reduced risk, and increased liquidity.

Akinrinola, Omojola, and Audu (2023) studied the impact of technology for digital financial inclusion on Nigeria's savings rate from 2009 to 2019. The study utilized the multiple regression model and the results indicated that while POS has a negative impact on savings levels in Nigeria, ATM, online pay, and mobile pay all have a favourable impact. The study concludes that the amount of savings in Nigeria is significantly impacted by digital financial inclusion.

Figuet and Kere (2022) evaluated the influence of digitalization of financial services on financial inclusion in Africa from 2011 to 2017. Using several methodological reviews, the study discovered the existence of a positive and significant impact of mobile money and digital payments on bank account penetration, access to credit and savings mobilization.

Mbuthia and Ndiritu (2020) assessed the factors that influence Kenyan savings mobilization in formal financial institutions in 2009. The study utilized a non-experimental research design and employed both descriptive and inferential statistics for data analysis. Findings revealed that factors such as the availability of loans, one's level of financial literacy, where one lives, what industry one works in, expectations for the future state of the economy, one's level of income, the number of banks in one's neighbourhood, transaction costs, and the distance to the nearest bank branch all have an impact on whether a household decides to save money in formal financial institutions.

Eke, Okoye and Omankhanlen (2021) examined the prior-savings theory in Nigeria from 1980 to 2018 using an improved Toda-Yamamoto long-run non-causality approach. The results revealed that gross fixed capital formation (GFCF) is significantly negatively impacted by pension saving, which may imply weak linkage between the economy's instrument for savings development and (GFCF). This outcome, in part, provide evidence of savings development study-gap in Nigeria.

Odejimi and Edogiawerie (2019) examined the reasons why rural microfinance institutions have been unable to effectively mobilise savings or bank services in Nigeria using the Chi-square and Pearson's Correlation Matrix. Findings showed that the Okada community's funds have not been effectively mobilised by ABC Microfinance Bank.

Loaba (2021) investigated the effect of mobile banking services on savings habits in West Africa in 2017. The study utilized the Multinomial logit model and a probit model, and the findings revealed that using mobile banking services enhances the chance of formal and informal savings by 2.4% and 0.83% respectively.

Ouma, Odongo and Were (2017) examined the association between mobile phone money usage and savings mobilisation in Kenya, Uganda, Malawi, and Zambia using descriptive analysis and survey data on mobile phone-based financial services. The study employed Ordinary Least Square, and the results showed that mobile phones are a significant route for increasing savings globally since they lower transaction costs, shorten travel distances, and improve convenience.

Banke and Yitayaw (2022) investigated the bank-specific and macroeconomic factors of deposit mobilization in Ethiopian banking sectors from 2011 to 2020 using explanatory design. The study utilized the quantitative approach and the findings revealed that loan to deposit ratio, capital adequacy, economic growth, inflation, population growth, and political stability all had a negative but significant effect on commercial bank deposit mobilization. The bank's profitability, on the other hand, has a positive and significant impact on commercial bank deposit mobilization.

Almost all the researches that have been done so far suggest, among other things, that digital financial services (DFS) promote savings and therefore boost economic growth, and as such, the DFS could stand-in as potent indicator for deepening the savings system in development. This study will be beneficial to financial institutions, academics, policy advocates, and individuals who are interested in achieving the Sustainable Development Goals (SDGs). Therefore, the focus of this study is on how digital financial services affect savings development in Nigeria.

Technology acceptance theory (Davies, 1985) explained the acceptance and usage of a new technology. According to Akinrinola, Omojola, and Audu (2023), it is safe to say that the usefulness of a financial technology is determined by the effectiveness of the transfer channels and instruments in the user's financial interactions with others. When compared with the existing transfer methods, if the proposed technology is not considered effective or more effective, the users would rather not accept it. This theory basically explains the conditions that will make a user accept a new technology to ease job performance (Aielemen, Enobong, Osuma, Evbuomwan, & Ndigwe, 2018). The variables such as the mobile transfers, point of sales services, web transfers had a positive impact on savings unlike the

automated teller machine (which is an older innovation). This means that users prefer the newer innovations as a means of savings which is in line with the technology acceptance model.

The Technology Acceptance Model (TAM) propounded by Fred Davis in 1985 involves a set of equations to describe the relationship between perceived ease of use, perceived usefulness, and actual usage of technology. TAM is a widely used model for understanding and predicting user acceptance of information systems and technology.

The original TAM consists of the following equation:

$$\text{Intention to Use} = f(\text{Perceived Ease of Use, Perceived Usefulness}) \dots\dots\dots i$$

The model suggests that an individual's intention to use technology is influenced by their perceptions of how easy it is to use (Perceived Ease of Use) and how useful it is (Perceived Usefulness). The intention to use then affects the actual usage behavior.

An econometric model for understanding technology acceptance based on the Technology Acceptance Model (TAM) involves regression equations to quantify the relationships between various factors.

$$\text{Actual Usage} = \beta_0 + \beta_1 * \text{Perceived Ease of Use} + \beta_2 * \text{Perceived Usefulness} + \varepsilon \dots\dots ii$$

Where:

Actual Usage: The dependent variable representing behavioral intention to use technology. The Perceived Ease of Use (EOU): One of the independent variables representing the perception of how easy the technology is to use. Perceived Usefulness (PU): Another independent variable representing the perception of how useful the technology is $\beta_0, \beta_1, \beta_2$: Coefficients to be estimated through regression analysis, indicating the impact of each independent variable on the dependent variable. ε : The error term representing unobservable factors affecting the dependent variable.

3. Methodology and Data

The autoregressive distributed lag (ARDL) was employed for the analysis. Descriptive, correlation, unit root and cointegration tests were engaged in the pre-estimation phase of the analysis. Monthly data were sourced from the Central Bank of Nigeria Statistical Bulletin (CBN, 2021) from 2009 to 2021. This period was

chosen due to the availability of data and provides enough observation for dynamic analytics. Taking inference from the theoretical framework, the study proposed an ARDL model. Substituting the current variables into equation 3 in the theoretical framework becomes thus:

$$TS_t = \beta_0 + \beta_1 ATM_t + \beta_2 MT_t + \beta_3 POS_t + \beta_4 WT_t + \beta_5 INF_t + \mu_t \dots\dots\dots$$

iii

The dynamic long-run form of equation (3) after expressing same in log-linear form is specified thus:

$$\Delta \ln TS_t = \beta_0 + \beta_1 \Delta \ln ATM_t + \beta_2 \Delta \ln MT_t + \beta_3 \Delta \ln POS_t + \beta_4 \Delta \ln WT_t + \beta_5 \Delta \ln INF_t + \gamma ECM_{t-1} + v_{it} \dots\dots\dots$$

iv

The dependent variable in the analysis is TS, which represents total savings in Nigeria’s financial sector. The independent variables include Automated Teller Machine transactions (ATM), Mobile transfers (MT), Point of Sales (POS) and Web Transfers (WT). Additionally, inflation (INF) was included as a control variable, as it is expected to impact total savings in the financial sector in Nigeria. β_0 is the constant term, β_1 to β_5 are the parameters of the regression equation while γ is the adjustment parameter which shows the extent to which the disequilibrium in the explanatory variable (ΔTS_t) is being corrected each period. v_{it} is the white noise error term and ECM_{t-1} is the lagged time series of residuals from the co integrating vectors. Equation 4 incorporates a corrective mechanism by which previous disequilibria in the relationship between the digital financial services indicators and savings development. This way, an allowance is made for any short-run divergence in savings development from the long-run target. This model assumes a linear relationship between TS and the independent variables, and that the effects of the independent variables on TS are additive. It also assumes that the error term is normally distributed and has constant variance.

4. Data Analysis and Interpretation of Results

4.1 Descriptive Analysis

Table 1: Showing result of descriptive analysis

	TS	WT	POS	MPB	INF	ATM
Mean	4.3485	4.4126	4.4771	4.4011	1.07966	5.4634
Maximum	5.3367	7.6688	6.3652	6.6937	1.2723	6.3895
Minimum	0.7870	2.9445	1.5863	1.3010	0.8865	4.2667
Std. Dev.	1.2121	1.3692	1.0350	1.3391	0.1073	0.4906
Skewness	-1.6067	1.5279	-0.1934	-0.3095	-0.0702	-0.4605
Kurtosis	4.4517	3.9076	2.1665	2.4225	2.0583	2.7324
Jarque-Bera	80.8149	66.049	5.4886	4.6578	5.8928	5.9800
Probability	0.0000	0.0000	0.0643	0.0974	0.0525	0.0503
Obs	156	156	156	156	156	156

Source: EViews Output, 2023

Table 1 displays the descriptive statistics for savings and digital financial service indicators in Nigeria: Total Savings (TS), Automated Teller Machine (ATM), Mobile transfers (MT), Point of Sale (POS), Web Transfers (WT) and Inflation rate (INF). Total savings have an average of 4.35 billion naira, exhibiting substantial variability spanning from 0.79 to 5.34 billion naira. The distribution skews towards higher savings, and the elevated kurtosis of 4.45 suggests a leptokurtic distribution. Meanwhile, Web Transfer average 4.41 million naira, with notable variation between 2.94 and 7.67 million naira. The distribution skews to the right due to a low transaction with very high values, and the kurtosis of 3.91 indicates a leptokurtic distribution.

Similarly, point of sale transactions, averaging 4.48 million naira, showcase variability between 1.59 and 6.37 million naira, with a moderately left-skewed distribution and a kurtosis of 2.17, implying platykurtic distribution. Mobile transfer values, averaging 4.40 million naira, reflect variation from 1.30 to 6.69 million naira, with a moderately left-skewed distribution and a kurtosis of 2.42, suggesting a platykurtic distribution. Inflation rates on the other hand, remain relatively stable around 1.08%, with low variability with a slightly left-skewed distribution, and a kurtosis of 2.06 indicating moderately heavy tails which also suggest a platykurtic distribution. Automated Teller Machine (ATM) transactions, averaging 5.46 million naira, indicating a limited variation between 4.27 and 6.39 million naira, with a slightly left-skewed distribution. The kurtosis of 2.73, implying a platykurtic distribution.

Meanwhile, total savings and Web Transfer variables, deviate from normal distribution while, the data generating process of automated teller machine, point of sale, inflation and Mobile transfer are normally distributed because the probability of the Jarque-Bera statistics are higher than 5 percent significance level.

4.2 Correlation analysis

Table 2: Correlation results

	TS	WT	POS	MT	INF	ATM
TS	1					
WT	0.3340	1				
POS	0.7131	0.7612	1			
MT	0.7829	0.7740	0.9731	1		
INF	-0.1051	0.3838	0.2704	0.2158	1	
ATM	0.8015	0.7699	0.9363	0.9497	0.1933	1

Source: EViews Output, 2023

The findings presented in table 2 offer a comprehensive correlation analysis among the variables TS (Total Savings), ATM, MT (Mobile transfer), POS (Point of Sale), WT (Web Transfer), and INF (Inflation). This correlation matrix analysis yields valuable insights into the interrelationships among these variables, unravelling their underlying connections. The outcomes reveal noteworthy patterns of correlation, shedding light on how changes in one variable may correspond to changes in another.

The results underscore a moderately weak correlation of 0.33 between Total Savings (TS) and Web Transfer (WT). This implies that an increase in total savings tends to be accompanied by a rise in WT transactions. In contrast, a robust positive correlation of 0.71 exists between Total Savings (TS) and Point of Sale transactions (POS). This suggests that heightened total savings might lead to an increase in POS transactions. Similarly, Total Savings exhibit a substantial positive correlation of 0.78 with Mobile transfer transactions (MT), indicating that higher total savings correlate with increased MT values. This relationship implies that as total savings rise, there's a propensity for Mobile transfer transactions to increase.

Likewise, a strong positive correlation of 0.78 emerges between Total Savings (TS) and Automated Teller Machine transactions (ATM). Consequently, as total savings escalate, ATM transactions also tend to ascend. This correlation underscores a plausible linkage between total savings and ATM activity, suggesting that higher total savings might align with heightened ATM usage. On a different note, a minor

negative correlation of -0.10 is observed between Total Savings (TS) and Inflation (INF). This indicates that fluctuations in total savings are not notably connected to shifts in inflation values. Evidently, none of the correlation coefficients surpass 0.8, signifying the absence of multicollinearity concerns in the model. This reassures the reliability of the identified individual relationships by highlighting that the variables under analysis are not strongly interdependent.

1.3 Stationarity test (Unit root)

To mitigate the risk of producing inaccurate or misleading outcomes, an assessment of data stationarity was conducted using the Augmented Dicky fuller. The comprehensive outcomes of these analyses are meticulously outlined in table 3.

Table 3: Unit root test with Individual Intercept

Variables	ADF Statistic	PP Statistic	Decision
TS	-4.207	-4.207***	I(0)
ATM	-14.673	-15.273***	I(1)
MT	-12.947	-13.454***	I(1)
POS	-11.987	-23.468***	I(1)
WT	-13.889	-14.064***	I(1)
INF	-5.993	-12.627***	I(1)

Source: EViews Output, 2023

The stationarity test reported in table 3 shows ADF and PP test statistics with individual intercepts. The Result indicates that TS was stationary at levels I~0(indicating no unit root) while ATM, MT, POS, WT, and INF were stationary at first difference, I~1(indicating existence of a unit root).

4.4 Cointegration test: As depicted in table 3, a majority of the variables exhibit an integrated order of I(1), indicating the presence of unit roots. Consequently, the logical course of action involves conducting co-integration tests among these variables to explore potential interrelationships. To facilitate this examination of co-integration, a stationarity test is conducted. In this regard, the analysis employs the ARDL F Bounds test, which assumes a null hypothesis implying the absence of co-integration.

Table 4: F Bounds Test**Null Hypothesis: No levels relationship**

Test Statistic	Value	Sign	I(0)	I(1)
F-statistic	6.7152	10%	2.26	3.35
k	5	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Source: EViews Output, 2023

The F bounds test results in table 4 also strongly rejected the null hypotheses of no co-integration in the model because the parameters values of F statistics (6.71) is higher than the I(0) and I(1) bounds. The study concludes that there is a long-run relationship in the model.

4.5: Optimal lag length test: The optimal lag length was established through the VAR lag length criteria. The result is presented in table 5.

Table 5: VAR Lag Order Selection Criteria

LAG	LOGL	LR	FPE	AIC	SC	HQ
0	209.9827	NA	7.04e-07	2.86	2.98	2.91
1	836.9205	1996.74	1.08e-12	-10.52	-9.68*	-10.18*
2	870.1070	60.65	1.12e-12	-10.49	-8.93	-9.85
3	909.8426	69.47*	1.07e-12*	-10.54*	-8.26	-9.62
4	925.3697	25.91	1.42e-12	-10.26	-7.27	-9.05
5	943.0969	28.17	1.84e-12	-10.02	-6.31	-8.51

Source: EViews Output, 2023

Based on the outcomes of lag length criteria obtained from the VAR analysis, lag length 3 emerged as the favored choice for estimation. This suggests that for the subsequent ARDL estimation, the optimal lag length is also determined to be 3, as indicated by several lag length criteria.

4.6: Short-run results

Table 6: Short-run ARDL Estimate: D.V.: TS

Variable	Coefficient	Prob.
C	-2948.75***	0.0065
Δ (ATM)	-0.0039	0.5275
Δ (ATM(-1))	-0.0330***	0.0003
Δ (ATM(-2))	-0.0248***	0.0002
Δ (POS)	-0.0094	0.2809
Δ (POS(-1))	0.0203***	0.0236
Δ (POS(-2))	-0.1086***	0.0000
Δ (WT)	0.0002	0.3950
Δ (WT(-1))	0.0010***	0.0017
Δ (WT(-2))	0.0016***	0.0000
Δ (MT)	0.0122***	0.0016
Δ (MT(-1))	0.0175***	0.0000
ECM(-1)*	-0.1624***	0.0000
R-squared	0.7424	
Adjusted R-squared	0.7203	
F-statistic	33.62	
Prob(F-statistic)	0.0000	
D.W	2.4225	

Source: EViews Output, 2023

The results in table 6 revealed that 74% of the variations in total savings was explained by the variation in the explanatory variables in the ARDL model. The results from the ARDL estimator show that there is an indirect and significant relationship between digital financial services indicators and total savings. The results also show the significance of the model (model fit). The F coefficient of 33.62 and significance value of 0.000 prob.< 0.05), shows that overall, the regression model statistically and significantly predicts total savings in the financial sector in Nigeria well. Meanwhile the Durbin Watson value of 2.42 is close to 2 and indicates an absence of autocorrelation in the model.

The result also revealed that Automated Teller Machine (ATM) has a negative significant effect on total savings ($\beta = -0.033^{***}$, $n = 156$, $p = 0.000$) at lag 1 and lag2 ($\beta = -0.024^{***}$, $n = 156$, $p = 0.000$) respectively. The result implies that holding other variables constant, a 1 unit increase in the number of Automated teller

machine withdrawals will likely lead to 0.03 and 0.024 percent decrease in the total savings on the average in Nigeria.

Furthermore, the result revealed that Point of Sale (POS) has a positive significant effect on total savings ($\beta = -0.0203^{***}$, $n = 156$, $p = 0.023$) at lag 1 and negative significant effect on total savings ($\beta = -0.108^{***}$, $n = 156$, $p = 0.000$) at lag 2 respectively. The result implies that holding other variables constant, a 1 percent increase in POS transactions will likely raise the total savings by 0.02 at lag 1 but reduce total savings by 0.11 percent at lag 2 on the average in Nigeria.

The result further revealed that Web Transfer (WT) has a positive significant effect on total savings ($\beta = -0.001^{***}$, $n = 156$, $p = 0.001$) at lag 1 and lag 2 ($\beta = -0.0016^{***}$, $n = 156$, $p = 0.000$). The result implies that holding other variables constant, a 1 percent increase in the WT transactions will likely raise the total savings by 0.01 and 0.016 percent on the average in Nigeria.

The result also revealed that Mobile transfer (MT) has a positive significant effect on total savings at lag 1 ($\beta = 0.012^{***}$, $n = 156$, $p = 0.0001$) and lag 2 ($\beta = 0.017^{***}$, $n = 156$, $p = 0.0000$) respectively. The result implies that holding other variables constant, a 1 percent increase in the Mobile transfer transactions will likely raise the total savings by 0.012 and 0.017 percent on the average in Nigeria. The Error Correction Mechanism (ECM), for the equation, that is, short-run dynamic adjustment to long term equilibrium satisfies the a priori expectations suggesting that the short-run shocks are corrected annually at an adjustment speed of 16.2%.

During the error correction (ECM) process, inflation was automatically filtered out of the model because it was not required to provide the corrective measure to enhance total savings in Nigeria. Hence the new model becomes thus:

$$\Delta \ln TS_t = \beta_0 + \beta_1 \Delta \ln ATM_t + \beta_2 \Delta \ln MT_t + \beta_3 \Delta \ln POS_t + \beta_4 \Delta \ln WT_t + \gamma ECM_{t-1} + v_{it} + \dots + v$$

4.7: Long-run results

Table 7: Long-run ARDL Result. D. V.: TS

Variable	Coefficient	Prob.
ATM	0.390	0.000
POS	-0.052	0.559
WT	-0.009	0.000
MT	-0.054	0.235
INF	-383.953	0.826

Source: EViews Output, 2023

Result in table 7 reveals the long-run ARDL result. From the result, ATM transactions have a positive significant ($\beta = 0.390^{***}$, $n = 156$, $p = 0.000$) long-run effect on total savings while WT transactions have a negative significant long-run effect on total savings as well ($\beta = 0.009^{***}$, $n = 156$, $p = 0.000$) in Nigeria. However, MT, POS and INF were found to have no long-run effect on total savings in Nigeria financial sector.

4.8 Post Estimation Test: Post estimation was also conducted to determine the reliability of the study. A serial correlation test and heteroscedastic tests were conducted

Table 8: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.3448	Prob. F (2,138)	0.7090
Obs*R-squared	0.7607	Prob. Chi-Square (2)	0.6836

Source: EViews Output, 2023

Table 8 above estimated how much autocorrelation there was in the model. The likelihood value of the F-statistics, which assesses the presence of auto correlation, was discovered to be higher than 0.05. This shows that the null hypothesis of no autocorrelation is accepted, and we draw the conclusion that the model is free of the autocorrelation problem.

Table 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.8656	Prob. F(9,145)	0.0615
Obs*R-squared	16.0858	Prob. Chi-Square (9)	0.0651
Scaled explained SS	758.9186	Prob. Chi-Square (9)	0.0000

Source: EViews Output, 2023

The existence of unequal variance among the explanatory variables was evaluated using the Breusch-Pagan-Godfrey Heteroskedasticity Test. The results show that both the F-distribution (Test Statistic = 1.866 and P-value = 0.062) and the R^2 (Test Statistic = 16.086 and P-value = 0.065) indicate that we do not reject the null hypothesis hence, the study concludes that there is no Heteroscedasticity problem in the model.

4.10 Discussion and implications of findings

The study investigates the influence of digital financial services on savings in Nigeria. Pre-estimation checks were conducted to ensure accuracy and

dependability of the results. The results reveal that 74 percent of the variability within the dependent variable is explained by the explanatory variables. This underscores the robustness of the model in capturing the dynamics between digital financial services and savings within the financial sector. The study established that ATM transactions had a negative significant influence on the total savings in Nigeria's financial sector. This observation is coherent with the notion that increased ATM transactions might contribute to a reduction in the overall savings within the financial sector.

This phenomenon can be attributed to the enhanced accessibility that increased ATM transactions and provide individuals to basic banking services. Furthermore, a negative correlation between ATM transactions and total savings in the financial sector can be rationalized through behavioral and economic considerations. Specifically, ATM transactions often encompass cash withdrawals that cater to immediate consumption needs. In instances where individuals habitually withdraw cash for day-to-day expenditures, their allocation toward savings could consequently diminish. This behavioral tendency can indeed establish a negative relationship between ATM transactions and total savings. The findings support Yu, Jia, Li, and Wu (2022)'s findings that digital financial technologies tend to elevate consumption levels. Thus, if consumption is on the increase, there is likely to be a decrease in total savings (Peng & Mao, 2023). It is imperative for ATMs to be modified to encourage savings. However, in the long-run, ATM had a positive effect on savings. This implies that in the long-run, ATM is expected to contribute to increase in savings due to probable change in the financial behaviour of consumers towards their savings and withdrawal patterns.

In addition, the study found that Mobile transfer (MT), point of sales (POS) and Web Transfer (WT) had a positive significant effect on total savings in the short run. The positive and significant impact of these digital indicators on total savings suggests that the adoption and utilization of digital financial services contribute positively to the overall savings culture in the financial sector. This implies that individuals who engage in mobile money transactions are not only utilizing digital financial services for transactions but also leveraging them to enhance their savings habits. This could potentially advance financial inclusion by providing individuals with accessible and convenient tools to save and manage their finances. Furthermore, the finding highlights the role of technology, particularly mobile platforms, in promoting savings behavior (Akinrinola et al., 2023). As more individuals use digital financial platforms for transactions, they are also leveraging these platforms to set aside funds for future needs. This underscores the

transformative potential of digital financial services in reshaping traditional savings practices. Moreover, the positive effect of MT on total savings suggests a shift in consumer behavior towards more disciplined savings practices. Mobile transfer transactions may provide users with features such as automated transfers or designated savings accounts, thereby facilitating a structured approach to saving.

The study's findings align harmoniously with previous research, reaffirming the pivotal role of digital financial services in shaping consumer behavior. For instance, Li, Wu, and Xiao (2020) examined the impact of digital finance on the household consumption level in China. Their findings unveiled a noteworthy enhancement of household consumption owing to the adoption of digital financial services. This resonates with the current study, accentuating the capacity of digital financial tools to elevate consumption patterns within households. In a related development, Varlamova, Larionova, and Zulfakarova (2020) embarked on an exploration of the influence of digital technologies on savings behavior. Their investigations unearthed a robustly positive and significant effect, underscoring the potency of digital interventions in nurturing a culture of savings. This consonance with the current study reinforces the notion that digital financial tools can contribute to a positive shift in individual savings behaviors.

Moenjak, Kongrprajya, and Monchaitrakul, (2020) examined the multifaceted impact of financial technology on consumer savings and borrowing practices in Thai landscape and found that digital financial technologies fostered heightened overhead expenses among individuals. Their findings contribute a distinctive layer to the evolving landscape of digital financial adoption. Moreover, the insights of He and Song (2020) resonate harmonically with the present study. Their exploration into the impact of digital finance on household consumption supports findings. The synergies between their observations and the current study reinforce the consistency of the positive correlation between digital financial services and consumer behavior. These studies underscore the transformative impact of digital financial services on diverse aspects of consumer conduct. The echoing sentiment across these studies underscores the pervasiveness and validity of the symbiotic relationship between digital finance and evolving consumer dynamics.

2. Conclusion and Recommendations

This study examined the dynamics between DFS and savings development in Nigeria. The findings shed light on distinct relationships that underscore the transformative impact of digital finance on individual financial behaviors. Firstly, the study revealed a negative effect of ATM transactions on total savings within

the financial sector in the short run. This intriguing observation suggests that increased ATM transactions correspond to a reduction in overall savings. This could be attributed to the immediate and consumptive nature of cash withdrawals facilitated by ATMs, where individuals prioritize meeting day-to-day expenses over long-term savings commitments. However, in the long-run, ATM has a positive effect on total savings.

Conversely, the study unveiled a positive effect of MT, POS, and WT transactions on total savings in the short-run while WT had a negative long-run effect. Whereas, MT and POS had no long-run effect on total savings. The propensity of mobile financial services to enhance savings behavior becomes evident as individuals leverage these platforms not solely for transactions but also as mechanisms to bolster their savings habits.

Together, these findings demonstrated the multifaceted impact of digital financial services on the savings landscape in Nigeria's financial sector. The study's insights resonate with the broader global narrative of digital finance as a catalyst for reshaping consumer financial behaviors. As Nigeria increasingly adopts and integrates digital financial services, it becomes imperative for policymakers and financial institutions to harness these findings in refining strategies that encourage responsible financial behaviors and enhance individual financial well-being. Ultimately, the study emphasizes the critical role of digital financial services in altering how people perceive, access, and allocate their financial resources in the modern day. Therefore, the study concludes that by upholding the technology acceptance theory, digital technology would advance savings development in Nigeria. However, based on the research's findings several recommendations have been made as follows:

The Central Bank of Nigeria needs to create an enabling environment as well as policies to encourage the innovation of more digital savings platforms to increase savings. This can be achieved through awareness campaigns, incentives, and partnerships between financial institutions and merchants to create a seamless digital savings experience for customers.

Financial institutions should design user-friendly interfaces that facilitate savings and educate individuals about the benefits of using ATM for savings purposes. More ATMs should be designed for savings purposes since it had a positive effect in the long run. This could be done by integrating features that allow users to easily allocate a portion of their transactions towards savings, promoting a culture of

saving while conducting routine financial activities. The study suggests further research studies using different methodology.

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