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Technological Innovations and Financial Deepening Of Small and Medium Scale Enterprises in Nigeria

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Abstract: *This research looked at the 30 years between 1992 and 2021 in Nigeria to determine if there was any correlation between technological innovation and the financial development of small and medium scale firms. Measures of technological innovation, such as the prevalence of Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking (INTB) and Mobile Banking (MOB) were compared to a proxy for financial development—the ratio of credit extended to small and medium-sized businesses to GDP at basic prices (CSMSE-GDP) in Nigeria. Data for the study were culled from the Central Bank of the Nigeria (CBN) Statistical Bulletin, CBN Annual Report, CBN Bank Supervisory Annual Report, and Nigeria Deposit Insurance Corporation (NDIC) Annual Reports from 1992 through 2021. Statistical methods such as the unit root test, multiple regression analysis, and correlation analysis were employed. Based on the results, it is clear that the impact of technological innovation indicators on CSMSE-GDP in Nigeria is complex. Although INTB and MOB were shown to have no significant effects on CSMSE-GDP in Nigeria, the majority of the independent variables, including ATM and POS, did have significant effects. As a result, the research indicated that technology advancements had substantial effects on the financial development of SMEs in Nigeria. In light of the results, we suggest that appropriate rules be considered and developed to guarantee that no Nigerian, regardless of financial level, is denied access to the internet and related services. Because of this, it's important to put money into inexpensive infrastructure that improves the availability of high-speed internet and constant power.*

Keywords: Technological, Innovations, Small and Medium Scale, Enterprises and Financial Deepening

Introduction

Technology has changed the financial system worldwide. Technology has enabled new financial products, delivery channels, and business strategies. Digital financial services (DFS) have increased efficiency, speed, transparency, security, and availability of tailored financial services for all consumers (World Bank 2020). To compete, banks have introduced new products and expanded current ones using technology.

Branchless banking, electronic payment systems, online banking, and mobile banking are technological breakthroughs. Banks compete in the digital credit market to improve client access and differentiate their products and services (Financial Sector Deepening, (FSD), 2019). Commercial banks use digital financial tools to handle micro-accounts, build deposits, and assist the unbanked and underserved (Ndung'u, 2019; 2018).

Financial deepening improves financing for SMEs. Several empirical studies have shown that financial deepening improves the economic environment for SMEs by alleviating financing constraints (Beck, 2013), enabling the creation of new businesses (Cao-Alvira & Palacios-Chacón, 2021), and stimulating different economic opportunities and entrepreneurship activities (Dutta & Meierrieks, 2021; Koloma, 2021; Munemo, 2018). Thus, developmental policymakers must grasp how technological breakthroughs promote financial deepening and SME finance in Africa. If fully funded and given access to financial services, SMEs can alter and maintain economic and social development in underdeveloped countries (Moreira, 2016; World Bank, 2020).

The fourth industrial revolution, mobile phone proliferation, and internet and broadband connectivity have boosted the usage of new technologies in financial services (Del Gaudio et al., 2021; Liu et al., 2020; Mhlanga, 2020). ICT has made financial services more accessible and affordable and provided an atmosphere for innovative technologies. ICT spread has been studied in academia and the financial sector due to its domino effects on financial development and economic progress (Cheng et al., 2021; Owusu-Agyei et al., 2020). ICT diffusion's effects on financial deepening in Africa's banking sector, which dominates financial markets, have received less attention. This study evaluates Nigerian small and medium-sized firms' financial deepening and technological advancements.

Statement of the Problem

In many nations, authorities, financial players, and consumers have unanswered questions about these new developments. Laeven et al. (2015) argue that economic growth would stall unless financiers innovate, which raises several questions: Why do countries' technological innovations differ? Technological advancements have growth-enhancing and growth-restricting components. What

regulatory issues arise from these developments? Should non-bank financial service companies be subject to commercial bank regulations? What impact do digital platform-based innovations have on the economy, particularly in Africa, where adoption is rapid? Are commercial banks and the economy affected by the cost of investing in technology infrastructure to support technological innovations?

This study examines how technological breakthroughs affect financial depth, with the underlying assumption that a deeper financial system boosts economic growth. The technological innovations-financial deepening-growth nexus has not been extensively studied (Chipeta and Muthinja, 2018; Mustapha, 2018). Few empirical studies have examined Nigeria's technical advances. Few studies have examined the linkages between technological innovations and bank performance, monetary policy transmission, and growth directly without considering financial depth as the primary channel through which technological innovations impact economic growth (Chipeta and Muthinja, 2018).

The research on Nigeria contains significant flaws. First, they disregard the probable direct link between technical breakthroughs and financial deepening; even though multiple studies suggest that technology discoveries affect growth through many channels, financial deepening being the most important. Second, they neglect the individual consequences of technological advances' components. Third, they think technological breakthroughs cause economic growth; however there is evidence of reverse causality between technological innovations and financial depth and financial deepening of small and medium scale firms in Nigeria.

Review of Related Literature

Conceptual Framework

Technological Innovations

The OECD (2018) calls electronic money, mobile financial services, online financial services, i-teller, and branchless banking technologically disruptive. Financial disruptive innovations are defined by Michelle (2017) as "a pre-arrangement of some combination of money-related and payment benefits that are conveyed and monitored by portable or online improvements and a system of specialists." More financial service providers can serve more customers through e-money, mobile money, card payments, and electronic funds transfers (Durai & Stella, 2019).

Emerging economies deployed financial disruptive innovations (FDIs) during COVID-19. After the crisis, emerging markets may adopt disruptive technologies (IFC, 2020). Financial disruptive technologies (FDTs) include mobile phones, mobile wallets, computers, internet, debit or credit cards, and secure digital payment systems (Durai & Stella, 2019; Shofawati, 2019).

Traditional banking value chain and strategy have been disrupted. Thus, Fin-Tech collaboration and burrow tech acceptance are higher, unrelenting, and continually evolving than ever before (Omarini, 2017; PWC, 2017). FinTech has replaced traditional worth chains with restricted multi-modular and multi-directional hubs, which 90% of banks fear losing business to (KPMG, 2017). As open-banking begins, 33% of users use two burrow tech-bank services, combining digital platforms and data analysis to improve customer expectations and experience (Omarini, 2018).

Bastid and Rao (2017) attribute bank model disruption to constant development and tough risks, with the danger of lost market share to Fin-Techs inevitable given more than 73% of clients consume products from numerous platforms. Mobile burrow specialists and online media are digitising bank esteem chains, responding to and shaping client needs and expectations (Dedu and Nitescu, 2017) referenced in (Omarini, 2018). Flexible techniques help advanced banks stabilise value chains. The most difficult human-machine collective models separating clients from the financial corridor are block-chain, advanced analysis, vast data, and application interfaces.

Mechanical disturbance creates transportability, portability, competency, and financial development, turning banking into a virtual computerised finance field and Fin-Tech's problematic advantages by far outweighing threats by re-evaluating the competitive landscape. Faster cycles, more online action, exceptional competitiveness, cheaper tech-based banking, smaller branches, smaller labour forces, consolidation-driven combination, prolonged reevaluating, and a more client-centered value chain (Arner et al., 2017) resulted. Difficult burrow tech models break esteem chains, supplant heritage stages, and move essential skills from client care to tech-driven omni-channels (Dhar and Stein, 2017). This promotes rapid cycle computerization, open shared banking, and faster systems administration, diminishing unwaveringness and undermining customer maintenance approaches, according to Omarini (2018). This undercut classical banking's value chain, business model, and intermediation. Therefore, Fin-Tech collaboration and dig-tech adoption are high, constant, and revolutionising business models (Omarini, 2018; PwC, 2017). 90% of banks fear losing business to FinTech's shorter multi-modal and multi-directional nodes. As open-banking begins, a third of customers use at least two dig-tech-bank services to increase consumer expectations and experience (Omarini, 2018).

Bastid and Rao (2016) attribute bank model disruption to continual innovation and disruptive challenges, with Fin-Techs threatening market dominance since over 73% of clients use multiple platforms. Bank value chains and customer expectations are changing due to mobile and social media (Dedu and Nitescu, 2016). Value chain models last for digital banks. Customer-banking interactions are most threatened by block-chain, advanced analytics, big data, and app interfaces.

Banks outperform deposit money institutions and sustain market effectiveness using technological disruption (Kamau & Oluoch, 2016). Thus, bank financial success is measured by resource-to-revenue conversion. Equity, interest margin, and return on assets are efficiency indicators. With new payment technologies and asset alternatives to money, the banking subsector has risen in number and sophistication. This is due to technology and increased competitiveness. Payment systems are creating near alternatives to actual currency, influencing a basic part of banking operations (Okonkwo, Obinozie & Echekoba, 2016).

Technological advances and banking industry FP have been studied in developed and emerging economies. Financial innovation improves bank satisfaction, according to these studies. Nigeria, an emerging economy, has uneven financial innovation (FI) and bank efficiency. ATMs boost bank performance, according to Jegede (2016). FDIs do not boost Nigerian banks' ROE, according to Okonkwo, Obinozie & Echekoba (2016).

Financial Deepening and Entrepreneurship

Financial deepening permits financial markets to efficiently exchange products, services, savings, and investments, according to the International Monetary Fund (2016). According to Kiprop (2016), financial deepening is the expansion of financial services and access to basic financial services like credit, savings, and insurance, as well as the financial system's role in supporting society's progress. Financial deepening, according to Akhator and Marcus (2018), is the expansion of financial services to enhance society at all levels. Financial development, according to Fitzgerald (2016), involves building and expanding investment-friendly institutions, instruments, and markets.

Entrepreneurs need credit to start businesses. Demand-following theory says financial deepening comes from real sector demand growth and market diversification. As the real sector grows, so does the need for financial services, which releases traditional sector resources for productive use in the modern sector. Entrepreneurial development programmes assist generate small and medium-sized entrepreneurs who can start firms everywhere in the country, including in distant places (Ovat, 2016).

According to Nweze (2015), financial system development affects the quantity of funds that surplus economic units can mobilise and route to deficit units for output. The financial system actively searches for and draws savings and idle funds and allocates them to entrepreneurs, firms, consumers, and government for investment projects and other purposes with a view to returns, laying the groundwork for economic development. Financial deepening boosts economic growth and reduces poverty by improving access to financial services for the poor. Financial services encourage entrepreneurship and alleviate income inequality. Paramaditha (2015), a successful entrepreneur, feels financial deepening is needed to support small and medium firms due to giant corporations squeezing them out. A wider financial sector allows larger firms to raise bonds and stock, allowing banks to lend to SMEs.

John and Ibenta (2017) describe financial deepening as financial institutions' ability to promote financial intermediation, manufacture and expand financial services, and deliver them at affordable rates in an economy to support business growth. Money supply to GDP normally grows during financial deepening. (M2) money supply, private sector credit, and GDP at current basic prices are CBN (2018) financial deepening measures.

Theoretical Framework
Underpinning theory

There is a distinction between financial development and deepening, however the two terms are often used interchangeably. A country's financial development encompasses its financial sector (measured by the size of its financial markets, banks, and non-bank financial institutions) as well as its total economic output.

Disruptive digital technology, ICT infrastructure, and FinTech all fall under the category of technological advancements. Financial intermediation and disintermediation theories explain the relationship between technological progress and monetary deepening. The theory of financial intermediation (Werner, 2016) stated that when financial institutions are strengthened, more capital is made available for business startups and other productive endeavours. Diffusion of ICTs lowers transaction and intermediary costs (Chen, 2020), as well as information asymmetry and collateral demand (Asongu et al., 2019), and overcomes geographical constraints by expanding distribution channels.

The competing financial disintermediation theory (Navaretti et al., 2018; Thakor, 2020) posits that the substitution of non-financial entities for financial intermediaries limits financial deepening. There are a number of banking alternatives provided by FinTech

companies, including marketplace lending, crowd-lending, crowd-investing, and crowd-funding. When compared to conventional banks, FinTech firms provide more borrower conveniences, such as a wider range of loan amounts and terms, a shorter application process, and lower transaction fees and interest rates (Temelkov & Samonikov, 2018). Small and medium-sized enterprises (SMEs) with limited financial resources are more likely to look to FinTech firms for funding (Xiang et al., 2020).

According to Da Silva (2018), there are three main reasons why FinTech is expanding so quickly in emerging markets: (i) financial markets are new, so there is a need for new financial services; (ii) financial inclusion is low, so there are opportunities for FinTech entrants; and (iii) widespread access to the internet and mobile services. Adoption of FinTech varies from country to country based on a number of factors, including the price of financing, demographic shifts, competition, unmet demand, and macroeconomic conditions (Frost, 2020). These technical and financial intermediation theories suggest at least the following ways in which the widespread adoption of ICTs can boost financial deepening.

First, the spread of ICTs broadens access to banking services by expanding the number of channels that provide them. This includes (i) online banking, thanks to a larger population with access to the internet; (ii) mobile banking and mobile money accounts, thanks to more people having access to mobile phones; (iii) increased use of automated teller machines and brick-and-mortar branches; and (iv) internet-only banks that are not limited by physical locations. With the help of an agent bank, customers can make inexpensive withdrawals, deposits, loan repayments, and money transfers (Cull et al., 2018). Increases in financial intermediation are a direct result of technological advancements that lower the cost of providing financial services to all segments of society.

Second, deposits are mobilised via distribution channels thanks to technological advancements. Clientele can be expanded via mobile money's onboarding of previously unbanked clients, increased proximity to clients, and clients' ability to transact from anywhere, at any time. As a result of technological advancements, a large population can lower the amount of cash on hand and increase the amount of money deposited in banks while still feeling safe. Credit from banks grows in tandem with the size of their deposit bases (Ademi, 2016). Therefore, the widespread use of ICTs may increase debt financing and financial depth.

Finally, because to widespread adoption of ICT, disruptive financial innovations are helping to increase both financial depth and SME funding. Banks have a hard time determining the creditworthiness of SMEs because of the lack of transparency in their financial reporting. Diffusion of ICTs decreases information asymmetry, which leads to cheaper loan pricing and higher loan volumes (Asongu et al., 2019). To combat information asymmetry, collateral demand, and credit rationing, the block chain embedded credit model uses a distributed ledger to monitor SME loan repayments and defaults (Wang et al., 2019). Thus, technological advancements have made it possible for banks to lend to SMEs with verifiable histories and reputations.

Empirical Review

The research of Edo et al. (2019) was expanded by Owusu-Agyei et al. (2020), who examined 42 countries in Sub-Saharan Africa during the same time period and included additional proxies of financial development such as bank assets (as a percentage of GDP), bank assets (as a percentage of central bank assets), and credit from financial institutions (as a percentage of GDP). data identical to those found by Edo et al. (2019) were achieved by Owusu-Agyei et al. (2020), with baseline data acquired using pooled ordinary least squares.

Chien et al.'s (2020) empirical study widened the scope of previous research by including a longer time frame and additional nations. Chien et al. (2020) analysed the impact of ICT spread on monetary development using panel data for 81 countries from 1990 to 2015 and the generalised method of moments and panel smooth transition regression. As stand-ins for the spread of ICT, the authors looked at the number of internet users, mobile phone subscribers, and telephone users. Their research demonstrates that while widespread internet and phone use contribute to economic growth in both wealthy and developing nations, mobile phone subscriptions have a disproportionately positive effect on Africa.

When it comes to the economy, another group of studies examines how the spread of ICTs has affected banking sector efficiency and debt financing. Asongu et al. (2019) used the generalised method of moments and quantile regressions to investigate panel data for 162 banks across 42 African nations from 2001 to 2011. The authors demonstrate that widespread adoption of ICTs mitigates informational disparities, which in turn reduces lending costs and boosts the volume of loans available. Using fixed effects and instrumental variable regressions, Sheng (2021) examined the impact of FinTech on the provision of bank loans to SMEs in China from 2011-2018 and found that FinTech facilitates bank lending to SMEs very well.

Using data from the European banking industry from 1995-2015, Del Gaudio et al. (2021) determined that the adoption of ICT and financial technology has a favourable impact on banking performance measures and financial stability. Del Gaudio et al. (2021) employed indicators such as internet penetration, broadband availability, mobile phone penetration, and the number of automated

teller machines to bank branches as surrogates for ICT penetration. Wang et al. (2021) obtained similar findings on bank efficiency from their examination of a panel data set consisting of 113 banks in China spanning the years 2009-2018.

The latter studies provide empirical evidence that the increased use of ICT by banks enhances the effectiveness of their functions, including the screening of borrowers and the monitoring of their loans; better credit allocation and capital efficiency reduces operational costs; increases profits and risk-taking; and standardises the collection, storage, and management of customer data. These advantages of adopting ICT by banks have both direct and indirect effects on the availability of loans to SMEs.

Research Methodology

This investigation used an ex-post facto research strategy. The purpose of ex-post facto research is to determine how past variables affected a current occurrence. This method is employed because of its useful framework for locating, characterising, and making sense of the social phenomenon under investigation.

The Central Bank of Nigeria (CBN) Statistical Bulletin, the Central Bank of Nigeria (CBN) Annual Report, the Central Bank of Nigeria (CBN) Bank Supervisory Annual Report, and the Nigeria Deposit Insurance Corporation (NDIC) Annual Reports were used as secondary sources of data (time series data) for this study. These data sources were chosen because they provide the most accurate and trustworthy information for the research.

In this research, statistical methods of data analysis were used. The study checks the stationarity of the time series data by use of a unit roots test. The relationship between the independent [Technological Innovations proxied with Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking (INTB), and Mobile Banking (MOB)] and dependent [Financial Deepening proxied with Credit to Small and Medium Scale Enterprises to Gross Domestic Product at Basic Price (CSMSE-GDP)] variables was then analysed using descriptive statistics and a correlation analysis. Multiple regression analysis, implemented via the Regression model, with the aid of the statistical programme E-VIEWs 9.0, was selected as the method of data analysis. According to the standards of the relevant study, these procedures constitute adequate data analysis. The model which specifies that Financial deepening proxied Credit to Small and Medium Scale Enterprises to Gross Domestic Product at basic price (CSMSE-GDP) is significantly influenced by the Technological Innovations proxied with Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking (INTB) and Mobile Banking (MOB) is formulated as follows,

CSMSE-GDP = f(ATM, POS, INTB, MOB)
$CSMSE\text{-}GDP = \beta_0 + \beta_1 ATM + \beta_2 POS + \beta_3 INTB + \beta_4 MOB + U$
Where:
CSMSE-GDP = Credit to Small and Medium Scale Enterprises to Gross Domestic Product
β_0 = Constant Term
β_1 = Coefficient of Automatic Teller Machine Transactions
ATM = Automatic Teller Machine Transactions
β_2 = Coefficient of Point of Sale Transactions
POS = Point of Sale Transactions
β_3 = Coefficient of Internet Banking Transactions
INTB = Internet Banking Transactions
β_4 = Coefficient of Mobile Banking Transactions
MOB = Mobile Banking Transactions
U = Disturbance Term (other variable not mentions in the model)
The a priori expectation is $\beta 1, \beta 2, \beta 3, \beta 4 > 0$

Results and Discussions

Table 4.2: Descriptive Statistics

	CSMSE-GDP	ATM	POS	INTB	MOB
Mean	30.15200	1651.647	635.2960	79.75033	440.7650
Maximum	106.7100	7900.140	9400.160	675.9200	5080.960
Minimum	-60.07000	2.030000	1.010000	5.120000	1.010000
Std. Dev.	32.49869	2478.709	1816.958	145.2853	1046.275
Kurtosis	3.816572	3.253445	19.50164	12.17008	14.19805
Observations	30	30	30	30	30

Source: EVIEW, 9.0 Outputs, 2023.

Table 4.2 above is the presentation of the summary statistics. The mean value for the CSMSE-GDP recorded a mean value of 30.1520 with a Std. Dev. of 32.4987. Also, ATM, recorded a mean of 1651.65 and Std. Dev. of 2478.71, POS recorded that a mean of 635.30 with a Std. Dev. of 1816.96, INTB recorded that a mean of 79.7503 with a Std. Dev. of 145.2853, MOB recorded an average value of 440.7650 with a Std. Dev. of 1046.375, NIBSS recorded an average of 14948.31 with standard deviation of 24167.63 and NEFT recorded an average of 20132.11 and Std. Dev. of 45757.85. Since the standard deviations for all the variables are greater than respectively means, it shows that the data are widely dispersed. The normal distribution has a kurtosis of three, which indicates that the distribution has neither fat nor thin tails. Consequently, if an observed distribution has a kurtosis greater than three, the distribution has heavy tails when compared to the normal distribution. Since some the kurtosis coefficients in Table 4.2 are lesser than 3, this shows that CSMSE-GDP, ATM and NIBSS have thin tails while POS, INTB, MOB and NEFT thick tails because the kurtosis is greater than 3 when compared to the normal distribution.

Table 4.3: Correlation Matrix

	CSMSE-GDP	ATM	POS	INTB	MOB
CSMSE-GDP	1.000000				
ATM	-0.200770	1.000000			
POS	-0.074228	0.740401	1.000000		
INTB	-0.158503	0.727692	0.440898	1.000000	
MOB	-0.079182	0.750264	0.635740	0.794510	1.000000

Source: EVIEW, 9.0 Outputs, 2023.

Table 4.3 displays the results of the correlation test, which reveals that there is no multi-co linearity between the variables because all of the correlation values are less than 0.7. Further, a negative substantial association is shown between CSMSE-GDP and the explanatory variables—ATM, POS, INTB, and MOB—in Nigeria.

Table 4.4: Variance Inflation Factors Multicollinearity Test

Variance Inflation Factors
Date: 09/15/22 Time: 01:29
Sample: 1992 2021
Included observations: 29

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	76.47617	2.297524	NA
ATM	0.000129	34.85651	3.250911
POS	8.50E-05	9.501951	8.398498
INTB	0.007643	6.356742	4.803544
MOB	0.000156	6.079915	5.104478

Source: EVIEW, 9.0 Outputs, 2023.

Since the study's data are annual time series, a multicollinearity test was run (the results of which are shown in table 4.4) to determine whether or not the data contained multicollinearity. When there is a strong correlation between two or more independent variables in a data set, we say that the data set is multicollinear. Table 4.4 displays the variance inflation factor (VIF) calculations made to guarantee the reliability of these findings. In addition, for ATMs, POS terminals, INTBs, and MOBs, the Centred Variance Inflation Factor (CVIF) data regularly range from 3.2509 to 8.3985, 4.8035 to 5.1045, and 4.1088 to 1.1518. Since the threshold value of VIF is 10, this suggests that there are no multicollinearity issues with the variables being studied. Multicollinearity is frequently assumed to exist when the VIF value is more than 10.

Table 4.5a: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.333244	Prob. F(2,20)	0.7205
Obs*R-squared	0.935241	Prob. Chi-Square(2)	0.6265

Source: E-VIEW, 9.0 Outputs, 2023.

The residuals of the variables were determined before estimating the models to look for serial correlation. The LM test for serial correlation was used for this purpose. Table 4.5a shows the results of an LM test for serial correlation, and the p-values of the f-statistics are all statistically insignificant at the 5% level, indicating that serial correlation does not exist in the models.

Table 4.5b: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.427927	Prob. F(6,22)	0.8524
Obs*R-squared	3.030796	Prob. Chi-Square(6)	0.8050
Scaled explained SS	2.722576	Prob. Chi-Square(6)	0.8428

Source: E-VIEW, 9.0 Outputs, 2023.

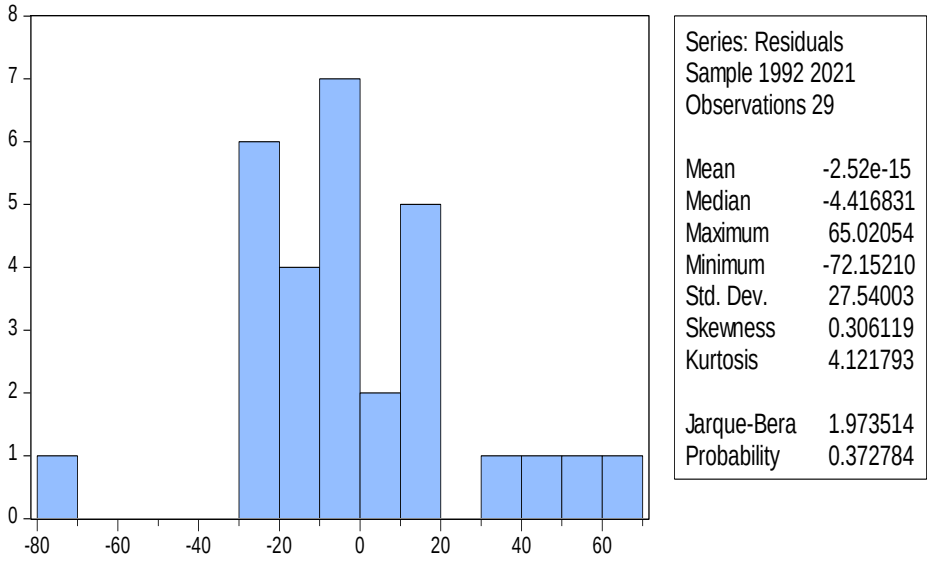
Heteroskedasticity is a problem that arises when there is a disparity in the range of values of two variables that are used to predict one another. The Breusch-Pagan-Godfrey heteroskedasticity test was run to guarantee homoscedasticity in the model estimation. The p-values of the f-statistics are not statistically significant at the 5% level, indicating that heteroskedasticity is not a concern in the models.

Table 4.5c: Ramsey RESET Test
Equation: UNTITLED
Specification: CSMSE-GDP C ATM POS INTB MOB
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.179840	21	0.2513
F-statistic	1.392022	(1, 21)	0.2513
Likelihood ratio	1.861287	1	0.1725

Source: E-VIEW, 9.0 Outputs, 2023
Table 4.5.1c shows that our data does not exhibit any signs of autocorrelation, as predicted by the Durbin Watson statistic. Since the probabilities of all three parameters are greater than the 0.05 significance level, we can conclude that the model is homoskendastic. The Ramsey test shows that our regression model is well-specified and stable.

Table 4.5d: Normality Histogram Test



Source: E-VIEW 9.0 Output, 2023.

To determine if the model residuals follow a normal distribution, a normality test was performed on the data. The standard errors and consequently the significance levels of the coefficients are affected when residuals are not normally distributed, indicating the

presence of significant outliers in the data. Because the histogram has a bell-shaped distribution and the J-B statistic probability value is 0.3728, which is greater than 0.05(5%), we can conclude that the residuals are normally distributed and reject the null hypothesis that they are not.

Table 4.6: Augmented Dickey-Fuller Unit root Test

Test Variables	ADF Test Statistic Value	Mackinnon Critical Value @ 5%	Order of Integration	P-Value	Decision
@Level					
CSMSE-GDP	-3.548069	-3.967767	1(0)	0.0737	Non-Stationary
ATM	-3.832469	-3.998064	1(0)	0.0984	Non-Stationary
POS	4.001880	-5.004861	1(0)	0.1231	Non-Stationary
INTB	-2.400930	-2.967767	1(0)	0.1502	Non-Stationary
MOB	-2.400930	-3.679322	1(0)	0.1702	Non-Stationary
@1st Difference					
CSMSE-GDP	-5.181379	-2.976263	1(1)	0.0003	Stationary
ATM	-3.395119	-3.004861	1(1)	0.0544	Stationary
POS	3.645139	-3.012363	1(1)	0.0375	Stationary
INTB	-3.894809	-3.012363	1(1)	0.0528	Stationary
MOB	8.578086	-3.012363	1(1)	0.0000	Stationary

Source: E-VIEW, 9.0 Outputs, 2023.

All of the variables (CSMSE-GDP, ATM, POS, INTB, and MOB) were found to be non-stationary at first difference 1(1) according to the ADF unit root test summary output shown in table 4.6. The fact that their individual ADF values are greater than the threshold value of 5% is indicative of this. Furthermore, the p-value for all variables is less than 5%, indicating a degree of significance larger than 95%, providing further evidence of stationary series. All of them became stationary at first difference, or order one, making the data appropriate for regression analysis.

Table 4.7: Multiple Regression Analysis

Dependent Variable: CSMSE-GDP
Method: Least Squares
Date: 09/15/22 Time: 01:16
Sample: 1992 2021
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	43.41754	8.745065	4.964804	0.0001
ATM	-0.024253	0.011376	-2.131983	0.0444
POS	0.026820	0.009222	2.908263	0.0518
INTB	-0.115378	0.087423	-1.319770	0.2005
MOB	-0.005605	0.012498	-0.448502	0.6582

R-squared	0.912017	Mean dependent var	28.09586
Adjusted R-squared	0.831775	S.D. dependent var	31.02457
S.E. of regression	31.06934	Akaike info criterion	9.916825
Sum squared resid	21236.69	Schwarz criterion	10.24686
Log likelihood	-136.7940	Hannan-Quinn criter.	10.02019
F-statistic	0.986561	Durbin-Watson stat	1.904056
Prob(F-statistic)	0.048096		

Source: EVIEW, 9.0 Outputs, 2023.

The coefficient of ATM is -0.0243, the t-value is -2.1320, and the p-value (sig. value) is 0.0444 according to the multiple regression data presented in Table 4.7. This data indicates that ATM significantly impacts the CSMSE-GDP negatively. The p-value of 0.0444 is less than the 5% level of significance, indicating that there is a significant association between ATM and CSMSE-GDP in Nigeria. This means that the alternative hypothesis is accepted and the null hypothesis is rejected. The coefficient of ATM is -0.0243, suggesting a negative relationship between ROE and ATM. If the ATM were to decrease by 1%, Nigeria's CSMSE-GDP would fall by -2.43%.

In addition, the POS coefficient of 0.0268 with a t-value of 2.9083 and a corresponding p-value (sig. value) of 0.0518 may be seen in the multiple regression findings presented in Table 4.7. This data provides support for the hypothesis that POS significantly improves CSMSE-GDP. The p-value of 0.0518 is less than or equal to 0.05 (5%), hence the alternative hypothesis (that POS does have an influence on CSMSE-GDP) is accepted and the null hypothesis (that it does not) is rejected. With a value of 0.0268, POS is positively correlated with CSMSE-GDP. The CSMSE-GDP of DMBs in Nigeria would grow by 2.68% for every 1% change in POS.

In addition, the coefficient of INTB is -0.1154, with a t-value of -1.3198 and a p-value (sig. value) of 0.2005, as shown in Table 4.7 above from the multiple regression findings. This evidence points to a negligible negative impact of INTB on CSMSE-GDP. The p-value of 0.2005 is greater than the 5% level of significance, so we accept the null hypothesis that INTB does not have a significant effect on CSMSE-GDP and reject the alternative hypothesis. With a coefficient of -0.1154, INTB is negatively correlated to CSMSE-GDP. In Nigeria, the CSMSE-GDP would fall by 11.54% for every 1% change in INTB.

Finally, the coefficient of MOB is -0.0056 with a t-value of -0.4485 and an associated p-value (sig. value) of 0.6582, as shown in Table 4.7 above from the multiple regression findings. This evidence points to a negligible, negative impact of MOB on CSMSE-GDP. The p-value of 0.6582 is greater than the 5% level of significance, so we accept the null hypothesis that there is no significant link between MOB and CSMSE-GDP and reject the alternative hypothesis. With a value of -0.0056, MOB is negatively correlated with CSMSE-GDP. In Nigeria, the CSMSE-GDP would decline by 0.56% for every 1% change in MOB.

Conclusion and Recommendations

The results show that the impact of technological innovation measures on Nigeria's CSMSE-GDP is complex. While most of the independent variables, including ATM and POS, have established significant effects on CSMSE-GDP in Nigeria, INTB and MOB have developed minor effects. Therefore, the research found that technology advancements significantly affect the development of SMEs' financial depth in Nigeria. In light of these findings, we propose the following policy changes to guarantee that all members of the Nigerian population, including those on lower incomes, have equal access to the internet and online services. That's why it's so important to put money into reasonably priced infrastructure projects like better internet and power lines.

These findings provide further evidence that traditional ATMs in branch networks are giving way to more digitally oriented means of service delivery. Therefore, in the future, banks' profitability will be heavily dependent on their investment in new, cost-efficient financial products. New government and private sector programmes should be developed that view finance and technology as the next frontier. These programmes should focus primarily on commercial banks.

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