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FINANCIAL TECHNOLOGY AND FINANCIAL INCLUSION: THE ROLE OF FINANCIAL LITERACY

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Abstract

Reports from the World Bank have shown that over half of the global adult population lacks access to formal financial services. This issue is particularly acute in less developed economies, where about 60% of individuals are without basic financial amenities. In Nigeria, despite advancements in financial technology, only 30% of the 109.8 million adult population has access to banking services. Previous studies examining the link between financial technology and financial inclusion have produced mixed results, with literature suggesting that financial literacy may influence this relationship. This study explores the moderating role of financial literacy in the relationship between financial technology and financial inclusion in Nigeria. Data were collected from 302 respondents, selected from a population of 1,460 registered SMEs in the Federal Capital Territory (FCT), Abuja, using the Krejcie and Morgan (1970) sample size determination table. Descriptive statistics and correlation techniques were used for initial analysis, followed by structural equation modeling (SEM) with Smart PLS software for

Keywords: Financial literacy, financial technology, financial inclusion, SMEs owners

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deeper insights. The results indicate that both financial technology and financial literacy significantly impact financial inclusion among SME owners. Furthermore, financial literacy plays a critical moderating role in enhancing the relationship between financial technology and financial inclusion. Based on these findings, it is recommended that policymakers and financial institutions focus on adopting and promoting financial technology tools specifically designed for SME owners. Additionally, targeted financial literacy programs should be implemented to equip SME owners with the necessary knowledge and skills to maximize the benefits of FinTech solutions.

Introduction

In recent times, financial inclusion has attracted widespread global attention as a vital tool for poverty alleviation and economic growth. Policymakers, economists, and governments increasingly acknowledge its essential role in promoting sustainable development (Monye, 2023; Oyadeyi, 2023; Marcellus, 2022). According to the World Bank's 2020 report, notable progress has been made, with 1.2 billion adults gaining access to financial accounts since 2011. However, 1.7 billion adults primarily from impoverished rural areas remain unbanked, with women in developing countries being disproportionately affected (Ahmad, Adamu & Murtala, 2023). These disparities indicate the pressing need for targeted policies and interventions to improve financial inclusion.

Sub-Saharan Africa has shown significant progress in financial account ownership and usage, largely fueled by mobile money innovations. The region's account ownership rates increased from 23% in 2011 to 55% in 2021, surpassing the global average growth rate. Despite these advancements, the region continues to rank among the lowest globally in terms of account ownership and usage, with Nigeria being a major contributor to the global unbanked population (Majorie & Gerhard, 2022). This persistent gap emphasizes the need for intensified efforts to expand access to valuable financial services across the continent to support sustainable economic growth (Tok & Heng, 2022)

In Nigeria, where only 30% of the adult population is banked despite widespread mobile phone ownership, the government has prioritized financial inclusion as a strategy for sustainable growth. Efforts by the Central Bank of Nigeria focus on leveraging technological innovations to provide affordable financial services to

underserved groups (Arotile, 2022; Oyadeyi, 2023). These initiatives align with the broader global push to promote financial inclusion and demonstrate the potential of digital tools to bridge existing gaps in financial access and usage.

Although advancements in fintech and digital payment systems have revolutionized Nigeria's financial sector, challenges persist in achieving comprehensive financial inclusion. The adoption of point-of-sale devices, mobile banking, and electronic payments has increased significantly, contributing to economic activities and GDP growth. However, barriers such as financial illiteracy, inadequate fintech adoption, and user accessibility hinder full participation in the financial system (CBN, 2021; NIBSS, 2022).

Hadad, (2024) noted that advancement of financial technology (fintech) has significantly reshaped financial behaviors and patterns, urging financial institutions to adapt to the digital age. Fintech acts as a catalyst for developing customer-centric financial products, promoting convenience, speed, and efficiency in service delivery (Oyadeyi, 2023). By leveraging innovations like digital payment platforms, fintech has expanded access to savings, credit, and insurance products, reducing the number of unbanked individuals, especially in developing economies (Nyamongo & Ndirangu, 2013; McKee, Kaffenberger & Zimmerman, 2015).

Despite the number of studies (such as David et al., 2022; Giaretta & Chesini, 2021; Benson, 2021; Akinosun, 2021; Akaba, 2020; Adegoke, 2021; Klus et al., 2019; Klapper & Popovic, 2019; Collon, 2018; Abdurahim & Ben, 2018; Alemam, 2018; Adepetun, 2017) that investigate the impact of financial technology on financial inclusion. However, these studies were conducted in western world and reported inconsistent findings. For instance, although David et al., 2022; Giaretta & Chesini, 2021; Benson, 2021; Akinosun, 2021; Akaba, 2020; Adegoke, 2021; reported positive and significant relationship between financial technology and financial inclusion. In negation to this, studies (e.g., Abedeen, Shabeer, & Rauf, 2024; Ashraf, Hafeez, & Sajid, 2022; Syauqi, Suryani,and Nugraha, 2023; Tidjani, & Madouri, 2024) reported weak and negative relationship between the variables. Hence the need to discover what moderate the relationship between fin-tech and financial inclusion. Consequently, Widiyatmoko et al. (2024) and Islam and Khan (2024) suggest that financial literacy may play a significant role in shaping the impact of financial technology on financial inclusion.

Individuals' ability to understand and effectively utilize financial tools and services is a critical factor in realizing the potential benefits of fintech innovations

(Widiyatmoko et al. 2024). Financial literacy equips users with the knowledge and skills needed to navigate digital financial platforms, make informed decisions, and manage risks associated with these technologies (Islam & Khan, 2024). This study therefore investigates the role of financial literacy on the relationship between financial technology and financial inclusion in Nigeria. Based on the problem above, three hypotheses have been formulated as:

Ho_1 Financial technology has no significant effect on financial inclusion among SMEs in FCT, Abuja.

Ho_2 Financial literacy has no significant effect on financial inclusion among SMEs in FCT, Abuja.

Ho_3 Financial literacy does not significantly moderate the relationship between financial technology and financial inclusion among SMEs in FCT, Abuja.

Literature Review

Concept of Financial Inclusion

Financial inclusion, as defined by Sarma (2008), transcends mere access to financial services, emphasizing the active use of formal financial systems by all economic participants. Mubiru (2012) correlates financial inclusion with social inclusion, highlighting its role in enabling individuals to contribute to and benefit from economic progress. Amidžić, Massara, and Mialou (2014) further elaborate on the concept, pointing to accessibility, affordability, and usability of financial services such as savings, loans, and insurance as key elements. The overarching aim is to integrate individuals into formal financial systems, reducing reliance on informal money lenders and enhancing financial security.

The World Bank (2019) differentiates between voluntary and involuntary exclusion, acknowledging that cultural and economic factors influence the use of financial services. Researchers like Parc and Mercardo (2015) emphasize the need for programs addressing involuntary exclusion caused by market imperfections and regulatory challenges. Rural areas often experience higher financial exclusion due to limited banking infrastructure and lower financial literacy levels (Hussaini and Chibuzo, 2018). Other barriers include inflexible product structures and regulatory hurdles, as noted by Dashi, Lahaye, and Rizvanolli (2013). Studies by Honohan (2008) reveal that factors such as mobile phone usage and institutional quality promote financial access, while high aid reliance and demographic pressures hinder it.

Measuring financial inclusion and development is a complex task, with indices developed by researchers like Amidžić et al. (2014) and Honohan (2008) incorporating variables such as demographic coverage, product usage, and institutional quality. Financial inclusion is closely tied to financial development, as discussed by Levine (2005), where the efficiency of financial instruments and markets contributes to economic growth by reducing transaction costs and managing risks. The evolution of digital financial inclusion represents a significant shift, driven by technologies like mobile banking and Fintech. Digital platforms have bridged traditional banking gaps, offering services to underserved populations (Sahay et al., 2020). Between 2014 and 2017, digital financial inclusion surged globally, even where traditional methods stagnated (World Bank, 2018). While studies by Fuster et al. (2019) and Tang (2019) indicate that Fintech complements traditional banking, its full impact on inclusion remains underexplored.

Problems of Financial Inclusion in Nigeria

The global challenge of financial inclusion is evident, with less than half of the adult population worldwide having access to financial services, a situation mirrored in Nigeria despite numerous financial reforms since independence. These reforms have spurred some growth in the financial sector but have failed to adequately address issues affecting underprivileged populations, impacting the country's HDI and economic growth. Rural dwellers and working-class citizens, often lacking financial literacy, face barriers to accessing financial services, necessitating awareness campaigns, accessible customer services, and literacy initiatives (CBN, 2017). Security concerns, such as fears of cyber hacking, further deter participation, highlighting the need for robust security measures and confidence-building efforts.

Financial Technology

Financial technology has revolutionized the banking industry by enabling financial transactions to occur beyond traditional physical premises using electronic devices such as mobile phones, ATMs, point-of-sale systems, and computers. This innovation facilitates a wide range of banking activities, including fund transfers, balance inquiries, bill payments, and account openings, making banking more accessible and convenient. Definitions of fintech vary among researchers; for

instance, Daniel (2005) highlights its role in delivering banking information and services through electronic platforms, while Abid and Noreen (2006) emphasize the use of information and communication technology for electronic transactions. The Basel Committee on Banking Supervision (2003) equates fintech with e-business in banking, reflecting its transformative impact on the sector.

At its core, financial technology represents the delivery of banking services through electronic channels, encompassing ATMs, internet banking, and mobile platforms. Although these technologies have existed for years, the internet has significantly advanced fintech's potential by serving as a robust delivery channel for banking transactions, reshaping how customers and institutions interact (Moddibo, 2018). Fintech enables a wide array of services, such as account management and financial transactions, by integrating communication and telecommunication technologies, thereby enhancing convenience and accessibility for customers.

In Nigeria, fintech has been central to the cashless policy aimed at reducing cash transactions. The Central Bank of Nigeria (CBN) has established cumulative weekly withdrawal and deposit limits of ₦500,000 for individuals and ₦5,000,000 for corporations, promoting electronic payment methods. Various electronic channels, including ATMs, Point of Sales terminals, web platforms, and mobile applications, are actively used, reflecting the advancements in technology and infrastructure (Babalola, 2018). These efforts demonstrate the country's transition towards a more technology-driven financial landscape, supported by indigenous firms and innovations.

The cashless policy does not entirely eliminate cash from circulation but minimizes its use in transactions. The system encourages electronic payments while allowing individuals and corporations to hold cash exceeding the stipulated limits, provided their transactions with banks remain within these thresholds over a specified period. By promoting electronic means of payment, the policy aims to enhance the efficiency of financial transactions and drive broader adoption of fintech solutions, signaling a shift towards a modernized and inclusive banking system in Nigeria (Tribune, 2022; Anaeto, 2022).

Empirical Review

Empirical studies on the role of financial technology (FinTech) in promoting financial inclusion and SME development reveal mixed outcomes across various

contexts. Syauqi, Suryani, and Nugraha (2024) investigated the impact of FinTech on financial inclusion and SME growth within Lombok's creative economy sector. Utilizing a structural equation modeling approach with a sample of 200 SMEs, their findings indicated a significant positive relationship. FinTech services enhanced SMEs' access to operational information and promoted trust among users due to the availability of regulatory safeguards and risk information, thereby fostering financial inclusion. Similarly, Nurohman, Kusuma, and Devi (2024) examined the interrelationship between FinTech, financial inclusion, and sustainability among Muslim-owned SMEs in Solo Raya, Indonesia. Using Partial Least Square (PLS) analysis on data collected from 96 SME owners, they also reported a positive correlation between FinTech and financial inclusion. Their findings underscore FinTech's capacity to enhance SME sustainability through improved access to financial services, particularly for niche demographic groups like Muslim entrepreneurs.

Contrasting these findings, other researchers reported a weak and negative relationship between FinTech and financial inclusion in specific contexts. Studies by Abedeen, Shabeer, and Rauf (2024); Ashraf, Hafeez, and Sajid (2022); and Tidjani and Madouri (2024) noted that the anticipated positive impact of FinTech on financial inclusion was not consistently observed. They attributed this to challenges such as limited digital infrastructure, user mistrust, and insufficient regulatory frameworks, which hinder the effective utilization of FinTech services. Building on their 2023 research, Syauqi et al. reiterated the significant positive influence of FinTech on financial inclusion and SME development in Lombok's creative economy. Their earlier findings, derived from a similar methodological approach, highlighted FinTech’s role in fostering trust and operational efficiency among SME operators. The consistency in their findings across multiple studies reinforces the argument for FinTech as a transformative tool in the SME sector.

On the other hand, the studies highlighting negative correlations suggest the importance of contextual factors in determining FinTech's effectiveness. For instance, regions with inadequate digital infrastructure or populations with low financial literacy may not experience the full benefits of FinTech. These findings emphasize the need for tailored strategies to address barriers specific to different demographics and geographic regions.

The contrasting outcomes in these studies underline the dual-edged nature of FinTech's impact on financial inclusion and SME growth. While some studies

demonstrate its potential to transform financial ecosystems positively, others highlight systemic challenges that limit its efficacy. These differences call for further investigation into the contextual factors that influence FinTech's success.

Moderating Role of Financial Literacy

Generally, a moderator is a qualitative or quantitative variable that influences the direction and/or strength of the relationship between an independent (predictor) variable and a dependent (criterion) variable (Baron & Kenny, 1986). Moderator variables are typically introduced when there is an unexpectedly weak or inconsistent relationship between the predictor and criterion variables. In this study, financial literacy is proposed as a moderator because past research on the relationship between financial technology (FinTech) and financial inclusion has yielded inconclusive results. Some studies suggest significant positive effects of FinTech on financial inclusion (e.g., David et al., 2022; Giaretta & Chesini, 2021; Benson, 2021; Akinosun, 2021; Akaba, 2020; Adegoke, 2021), while others show weak or even negative relationships between the two variables (e.g., Abedeen, Shabeer, & Rauf, 2024; Ashraf, Hafeez, & Sajid, 2022; Syauqi, Suryani, & Nugraha, 2023; Tidjani & Madouri, 2024).

Financial literacy plays a crucial role in enhancing the understanding and trust in FinTech, thereby promoting its adoption and contributing to financial inclusion. Financial literacy, defined as the ability to understand and effectively use various financial skills, including personal financial management and investment (Lusardi & Mitchell, 2014), is essential for SME owners to fully utilize FinTech tools, such as mobile banking, digital payment systems, and online lending platforms. Without adequate financial literacy, SME owners may struggle to navigate these tools effectively. Additionally, financial literacy helps mitigate risks associated with FinTech usage, such as fraud and data breaches, which could otherwise deter adoption. A study by Beck et al. (2018) highlights that SMEs with higher financial literacy are better equipped to navigate digital financial systems, ensuring the effective utilization of FinTech for business growth.

Theoretical Framework

The Technology Acceptance Model (TAM), introduced by Davis (1986), offers a theoretical framework to understand user attitudes and behaviors toward adopting new technologies (Monyoncho, 2018). TAM emphasizes two primary

constructs: Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). PEOU reflects the confidence users place in a system's simplicity and usability, while PU measures the degree to which users believe a system enhances their performance in the short and long term (Mojtahed, Nunes & Peng, 2011). Behavioral intention, shaped by these perceptions, ultimately determines a system's actual utilization. This model further posits that a technology's functionality and simplicity significantly influence users' acceptance, as perceptions directly relate to the system's effectiveness (Lim & Ting, 2012). Additionally, TAM provides a predictive framework for evaluating the likelihood of individuals and organizations embracing specific technologies, making it particularly valuable in understanding consumer behavior toward digital financial services (Mojtahed, Nunes & Peng, 2011; Lim & Ting, 2012).

An extension of the Reasoned Action Theory, TAM is designed to model user acceptance of information systems broadly and consistently. Its parsimonious and theoretically robust nature enables it to explain user behavior across diverse computing technologies and populations. The model also serves as a tool to analyze consumer attitudes toward innovations, clarifying why users accept or reject new systems (Lule, Omwansa & Waema, 2012). TAM's relevance extends to contemporary banking technologies, emphasizing customer acceptance as fundamental to achieving financial inclusion. In developing nations like Nigeria, where digital financial services adoption faces unique challenges, TAM provides critical insights into consumer behavior and the factors influencing technology adoption (Lim & Ting, 2012; Monyoncho, 2018).

Research Methodology

The current study employed a quantitative survey design, utilizing a structured questionnaire to collect data from participants. A total of 302 samples were initially drawn from a population of 1460 registered SMEs in the Federal Capital Territory (FCT), Abuja, using the Krejcie and Morgan (1970) table of determining sample size. The study applied cluster sampling to select the SMEs. Data were collected from owner-managers of registered SMEs within FCT, Abuja, with 302 questionnaires distributed. Of these, 300 questionnaires were returned and were used as valid responses in the final analysis. Descriptive statistics and correlational techniques were used to analyze the data, which was further examined using structural equation modeling (SEM) with Smart PLS software.

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Result and Findings

Measurement Model

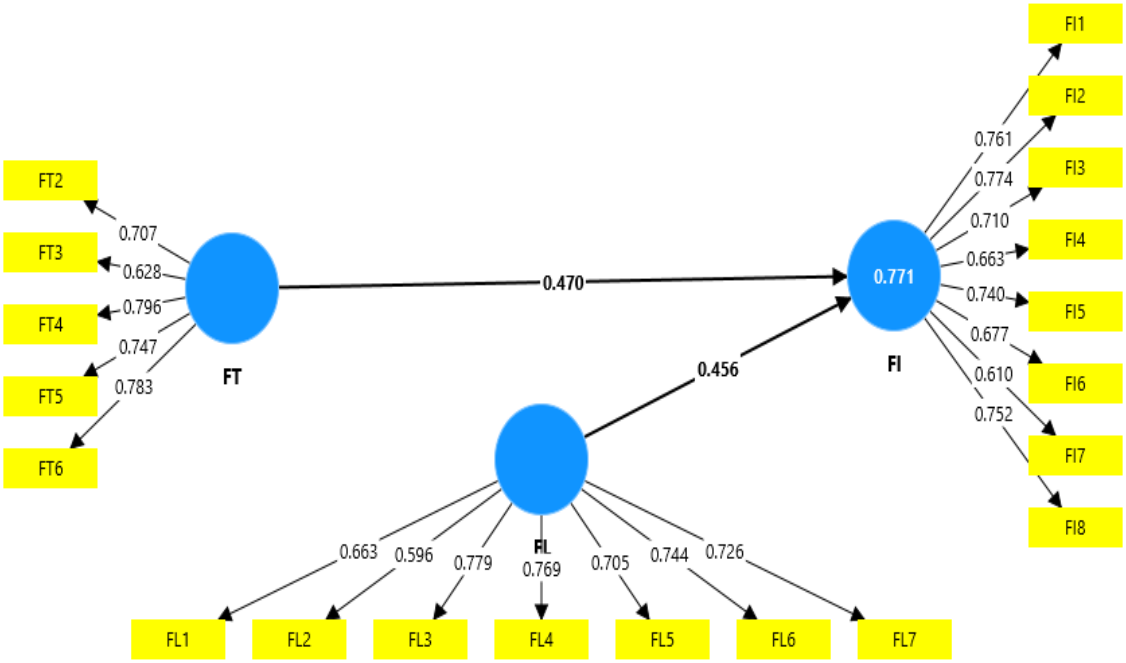


Figure 1: Measurement model

Figure 1 depicted the structure of the output of the measurement model for the direct relationship. The independent variables, fin tech and financial literacy are shown on the diagram with their indicators. They pointed to the dependent variable, financial inclusion. And the details discriminant validity is contained in table 1 and 2 below. Also, for discriminant validity the study employed the Fornell and larker criterion which states that the square root of AVE must be greater than the correlation with other variable in the study and Heterotrait-Monotrait Ratio (HTMT) method. This is as presented in table 1 and 2 below

Table 1: Discriminant validity – Fornell larker approach

	Fin Inclusion	Fin Tech	Fin Literacy
Fin Inclusion	**0.839**		
Fin Tech	0.831	**0.797**	
Fin Literacy	0.834	0.734	**0.714**

The square roots of AVE are presented in bold font on the diagonal, and it can be observed that the values are greater than the correlations among the constructs, thus this criterion is satisfied.

Table 2: Discriminant Validity- Heterotrait-Monotrait Ratio (HTMT)

	Fin Inclusion	Fin Tech	Fin Literacy
Fin Inclusion	0.300		
Fin Tech	0.233	0.882	
Fin Literacy	0.256	0.760	0.800

Source: SmartPLS 4, 2024

High HTMT values, particularly above 0.90, may indicate problems with discriminant validity (Henseler et al., 2015). As shown in Table 2, all inter-construct correlations were below the HTMT thresholds of 0.85, 0.90, and HTMT inference standards. This confirms that discriminant validity is effectively established using both traditional and advanced assessment methods.

Structural Model

The second part of the model is the structural model or inner model, Hair et' al. (2013) identified four key criteria for assessing the structural model in PLS-SEM.

Test of Hypotheses

The study examines the role of financial literacy on the relationship between financial technology and financial inclusion among SMEs owners inNigeria. The interpretation and summary of the result is presented in Table 3.

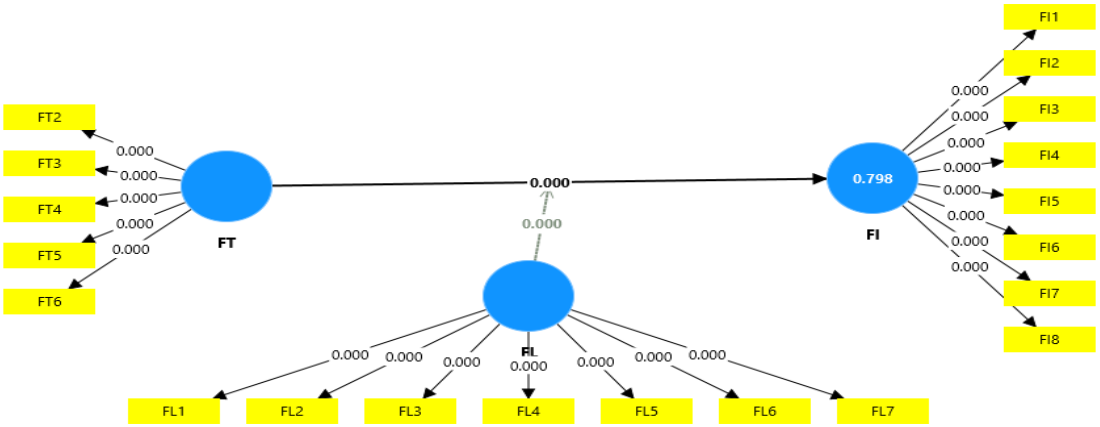


Figure 2

Structural model for both direct and indirect relationships

Figure 2 depicted the structural model of the study with moderating effect. It was noted that financial literacy showed a possible moderating effect on the direct relationships.

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Table 3: *Path coefficient with moderation*

Hyp	Relationship	Beta value	Std error	T stat	P values	Decision
Ho_1	FT -> FI	0.362	0.045	8.065	0.000	Rejected
Ho_2	FL ->FI	0.344	0.046	7.394	0.000	Accepted
Ho_3	FL x FT -> FI	0.196	0.18	5.477	0.041	Rejected

*****P value <0.01, **P value<0.05 * P-value<0.1**

From Table 3, for the direct relationship, it can be seen that financial technology has a positive significant effect on financial inclusion among SMEs owners (β = 0.362, t-value = 8.0.65, p-value = 0.000). This means a unit increase in financial technology will lead to 36.2% increase in financial inclusion. Thus, the first hypothesis (Ho_1) that states that financial technology does not significantly affect financial inclusion among SMEs owners in FCT, Abuja is rejected. Also, financial literacy has a positive significant effect on financial inclusion (β = 0.344, t-value = 7.394, p-value = 0.000). This means a unit increase in financial literacy will lead to 34.4% increase in financial inclusion. Thus, the second hypothesis (Ho_2) that states that financial literacy does not significantly affect financial inclusion among SMEs owners in FCT, Abuja is rejected. At moderation level, the result shows that financial literacy has a significant moderating effect on the relationship between financial technology and financial inclusion (*ß* = 0196.; *t* = 5.477; *p* = 0.041). Indicating a unit increase in the interaction of financial literacy and financial technology will lead to 19.6% increase in financial inclusion. Thus, hypothesis 3 which states that financial literacy does not moderate the relationship between financial technology and financial inclusion among SMEs owners in FCT is rejected.

Theoretical Implications

This study extends the theoretical understanding of financial inclusion by integrating financial literacy as a moderating variable in the relationship between financial technology and financial inclusion. The findings highlight the importance of financial literacy in enhancing the effectiveness of financial technology tools, supporting the resource-based view theory that emphasizes the role of internal capabilities in achieving better outcomes. Additionally, the study contributes to the growing body of literature on financial inclusion by demonstrating that financial literacy not only directly improves financial inclusion but also amplifies the positive effects of FinTech adoption.

Managerial Implications

For practitioners, the findings emphasize the necessity of promoting both financial technology adoption and financial literacy among SME owners. Policymakers and financial institutions should focus on designing user-friendly

FinTech solutions while concurrently offering financial literacy programs tailored to SMEs.

Conclusion

In conclusion, this study establishes that financial technology and financial literacy play significant roles in enhancing financial inclusion among SME owners in the Federal Capital Territory, Abuja. Financial technology directly contributes to improved access and utilization of financial services, while financial literacy not only has a direct positive impact but also strengthens the relationship between financial technology and financial inclusion.

Recommendation

Based on the study's findings, it is recommended that policymakers and financial institutions prioritize the adoption and promotion of financial technology tools tailored to the needs of SME owners. Additionally, targeted financial literacy programs should be implemented to equip SMEs with the knowledge and skills necessary to effectively utilize FinTech solutions. Collaborative efforts between government, financial institutions, and educational organizations can ensure broader access to digital financial services while fostering the financial empowerment of SME owners.

Suggestion for future research

Future studies on the role of financial literacy in the relationship between financial technology and financial inclusion among SMEs in Nigeria could explore regional and sectoral variations to capture contextual differences. Researchers may also incorporate behavioral factors such as trust, risk perception, and digital literacy as additional moderators. Longitudinal studies could assess the long-term impact of financial literacy initiatives, while gender-focused research can examine how financial literacy influences women-owned SMEs.

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