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Digital Literacy as a Mediator Between Digital Finance Adoption and Financial Inclusion Among SMEs in Oyo State, Nigeria

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Abstract

The study investigates the mediating role of digital literacy in the relationship between digital finance and financial inclusion among SMEs in Oyo State, Nigeria. Data were collected through a questionnaire administered to 298 SME CEOs across the Agro-allied, Manufacturing, Education, and Construction sectors. Path Analysis Structural Equation Modelling (PA-SEM) was employed as the primary analytical technique. Findings reveal that digital finance significantly enhances financial inclusion, while digital literacy also exerts a strong positive influence on financial inclusion. Furthermore, the analysis shows that digital literacy partially mediates the relationship between digital finance and financial inclusion, as confirmed through bootstrapping. This highlights the critical role of digital literacy in amplifying the benefits of digital finance for financial inclusion. The results suggest that SMEs with higher digital literacy levels are better equipped to utilize digital finance tools, such as mobile money, online banking, and payment platforms, thereby achieving greater financial inclusion. Consequently, it is recommended that SMEs prioritize developing the digital skills of their operators and employees to maximize the advantages offered by digital finance solutions.

Keywords: Digital finance, digital literacy, financial inclusion, Mobile money, Online banking

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1. Introduction

Small and Medium Enterprises (SMEs) are vital drivers of economic growth and development in both developed and emerging economies. As highlighted by Sajuyigbe et al. (2021), SMEs contribute significantly to the national Gross Domestic Product (GDP), accounting for 50–60% in developed economies and 30–40% in emerging economies. Al-Mudimigh and Anshari (2020) emphasize that this sector plays a critical role in fostering economic diversification, reducing dependence on single industries, and promoting inclusive growth. Similarly, Goyal, K., & Kumar, S. (2021) identify SMEs as the backbone of global employment, contributing over 60% of total jobs by creating opportunities in diverse sectors such as manufacturing, agriculture, and services. In Nigeria, SMEs are a cornerstone of the economy, contributing approximately 48% of GDP and employing about 84% of the workforce. This underscores their pivotal role as engines of economic dynamism, bridging the gap between large-scale industries and grassroots economies while driving sustainable development worldwide. According to Kapadia, S. (2019), SMEs also bridge the gap between formal and informal employment systems, fostering more inclusive labour markets.

Despite their significance, financial exclusion remains a major challenge for SMEs in Africa, particularly in the wake of the COVID-19 pandemic. In line with this observation, Sajuyigbe et al. (2021) note that the pandemic disrupted global economies, with SMEs among the hardest hit. The OECD (2020) also reported that over 80% of SMEs worldwide experienced financial shocks due to restricted access to financing during the pandemic, and more than 2 billion SMEs in African nations remain unbanked. Similarly, Shofawati (2019) notes that fees for opening accounts, transferring money, and accessing other financial services discourage low-income individuals from participating. The high costs associated with formal financial services make them unaffordable, driving many people toward informal financial systems. Likewise, Ojeomogha (2019) highlights that inadequate physical and technological infrastructure such as a limited number of bank branches, ATMs, and unreliable internet connectivity, particularly in rural areas restricts access to financial services. As a result, rural populations often remain excluded due to the high expense of providing services in remote locations. This financial exclusion has hindered the sector's growth and impact, especially in Nigeria, where SME development has slowed in recent years.

The advent of digital finance presents transformative opportunities to address these challenges. According to Ya et al. (2024), digital finance plays a crucial role in enhancing the financial inclusion of Small and Medium Enterprises (SMEs) by leveraging technology to provide better access to financial services. Banerjee et al. (2022) prove that digital finance solutions like mobile money, USSD banking, and payment apps enable SMEs in urban and rural areas to access banking services without the need for physical bank branches. In the same direction, Bao et al. (2018) reiterate that digital wallets facilitate the safekeeping and management of business funds, reducing the risks associated with cash handling. In Nigeria, initiatives like the Central Bank of Nigeria's cashless policy have promoted digital finance solutions that support SMEs (Boccaletti et al., 2022). This connotes that by bridging the gap between SMEs and the financial ecosystem, digital finance fosters economic growth, reduces poverty, and contributes to the sustainable development of the Nigerian economy.

Digital literacy has been recognized and documented in the literature as a strong tool that links digital finance to SMEs' financial inclusion. Digital literacy encompasses fundamental skills, such as navigating the internet, using digital devices, and understanding digital tools. While digital literacy may not directly provide financial resources, it can have a substantial indirect influence on digital finance and financial inclusion for SMEs in Nigeria ((Salisu et al 2022; Bodnaruk et, al., 2015). Ojeomogha (2019) argues that digital skills play a critical role in bridging the gap between digital finance and financial inclusion for SMEs. SMEs with adequate digital competencies are better positioned to leverage digital finance solutions effectively. Previous studies have established a link between digital finance and financial inclusion across various countries, including China (Ya et al., 2024; Agufa, 2016; Zhou et al., 2023), Indonesia (Chavali et al, 2021; Shofawati, 2019), England (Chen,

& Divanbeigi, 2019), Nairobi (Agufa, 2016), London (Barnard et al., 2020), South Korea (Edwin-Akakpo et al., 2024), India (Chavali et al., 2022; Cignitas et al., 2022), South Africa (Diptyana et al, 2022), Sri Lanka (Daronco, 2022), Pakistan (Manzoor, 2021; Rasheed et al., 2019), Uganda (Eton et al., 2021; Cignitas et al., 2022), Morocco (Dwivedi et al.,, 2021), and Kenya (Kambi & Onyiego, 2022; Agufa, 2016; Awinja & Fatoki, 2021). Despite these extensive studies, none have explored the influence of digital finance on the financial inclusion of SMEs when digital literacy is introduced as a mediating factor.

This study seeks to bridge the existing gap in the literature by investigating the mediating effect of digital literacy on the relationship between digital finance and the financial inclusion of SMEs in Nigeria. Its relevance is especially significant at a time when many SMEs in Nigeria are shutting down due to financial constraints. The study underscores the critical role of digital literacy and digital finance in enhancing the financial inclusion of SMEs and provides practical recommendations for the sector. It particularly addresses challenges such as limited access to traditional banking services and low levels of digital literacy, offering insights to help SMEs navigate these barriers effectively.

2. Literature Review

This section presents the theoretical framework of the study, exploring the relationship between digital finance and financial inclusion, while also addressing the mediating role of digital literacy. Furthermore, it examines findings from previous studies pertinent to this research.

Theoretical Framework

Several theories such as the Diffusion of Innovation Theory (Fabac, 2022), Resource-Based View (RBV) Theory (Gosal, 2023), Technology Acceptance Model (TAM) (Gosal, & Nainggolan, 2023), Capability Approach (Gum et al., 2023), Institutional Theory (Bodnaruk et al., 2015), and Financial Intermediation Theory (Buchak et al., 2018) provide a foundation for understanding the link between financial inclusion of SMEs, digital finance, and digital literacy. This study is anchored on the Resource-Based View (RBV) Theory, the Technology Acceptance Model (TAM), and the Capability Approach. These theories collectively explain how innovations, such as digital finance, are adopted within a population over time. They highlight that SMEs equipped with the necessary digital literacy are better positioned to adopt digital financial technologies effectively, thereby enhancing their financial inclusion.

Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory, introduced by Barney (1991), is a strategic management framework emphasizing the importance of an organization's internal resources in achieving competitive advantage and superior performance. RBV asserts that firms can gain and sustain a competitive edge by possessing resources that are valuable, rare, inimitable, and non-substitutable (VRIN). For SMEs, resources such as digital literacy represent critical assets that enable them to effectively utilize digital finance platforms, thereby enhancing access to financial services and promoting financial inclusion (Buehlmaier & Whited, 2018). Agufa (2016) further explains that SMEs can achieve financial inclusion by optimizing internal capabilities such as digital skills, technological infrastructure, and innovative approaches. These resources enable SMEs to overcome traditional financial access barriers, including high transaction costs and limited banking services. Demertzis et al. (2018) reinforce this perspective, emphasizing that sustained competitive advantage for SMEs is achieved by leveraging VRIN resources like digital literacy, technological access, and financial tools such as digital finance platforms.

Al-Mudimigh and Anshari (2020) highlight that digital literacy equips SME owners to access online financial services, expand into new markets, and manage financial records more effectively.

However, digital literacy remains a scarce and differentiating resource for many SMEs in emerging economies. Donald (2020) also notes that the acquisition of digital finance skills often requires training and experience, making them difficult for competitors to replicate. Without these skills, SMEs face significant challenges in accessing and utilizing digital financial tools, underscoring their indispensability for achieving financial inclusion. Similarly, Chipere (2018) attests that enhanced digital literacy improves SMEs' ability to adopt digital innovations, increasing operational efficiency, market reach, and decision-making quality. In addition, Chikalipah (2017) asserts that the RBV framework supports SMEs in accessing credit, savings, and payment solutions beyond the constraints of traditional banking systems. This is facilitated through platforms such as online banking, mobile money, peer-to-peer lending, and fintech solutions. Building strong partnerships with digital finance providers and tailoring solutions to SME needs can create competitive barriers for rivals.

The RBV framework also guides policymakers and SME stakeholders in fostering digital inclusion. For instance, investing in training programs to enhance SMEs' digital literacy ensures the effective use of digital finance tools. Encouraging partnerships with fintech providers can result in the development of affordable and accessible financial solutions while designing incentives promotes the adoption of digital financial tools as strategic resources. In summary, RBV theory is highly relevant to this study as it underscores the critical role of digital literacy and digital finance as strategic resources for SMEs to achieve financial inclusion. By investing in these capabilities, SMEs can overcome traditional barriers to finance, improve operational efficiency, and secure a competitive advantage in the digital economy.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a theoretical framework developed by Davis (1989) to explain and predict user acceptance of technology (Hai et al., 2022). TAM posits that two key factors determine whether an individual adopts a particular technology for instance, the extent to which a person believes that using the technology will enhance their performance or productivity, and the degree to which a person believes that using the technology will be free of effort. These factors influence an individual's attitude toward technology, which, in turn, determines their behavioral intention to use it and ultimately their actual technology adoption. TAM is widely used to understand technology adoption in various fields, including digital finance and financial inclusion (Awinja et al. 2021). Guo et al. (2020) claim that digital literacy plays a critical role in SMEs' ability to perceive the value of digital finance and integrate it into their operations for financial inclusion. Digital finance platforms such as mobile money, peer-to-peer lending, and online banking can demonstrate their value by offering fast and convenient financial services that save time and reduce costs for SMEs through user-friendly interfaces, simple onboarding processes, and support in local languages that can make digital finance platforms more accessible to SMEs, especially those with limited technical expertise (Bravo et al., 2018).

Bongomin et al. (2018) assert that the Technology Acceptance Model (TAM) provides a framework for SME operators to overcome barriers to financial inclusion through digital finance platforms. These platforms incorporate features specifically designed to meet SME needs, such as microloans**,** low transaction fees, and scalable services, which promote their adoption. Additionally, enhanced digital literacy enables SMEs to access and effectively utilize these platforms, helping them address traditional challenges such as limited access to banking services and high transaction costs. Similarly, Demirguc-Kunt et al. (2017) emphasize that the Technology Acceptance Model (TAM) supports the design of training programs aimed at enhancing the understanding and adoption of digital finance solutions. These programs focus on demonstrating the practicality of digital tools in critical areas such as cash flow management**,** transaction tracking, and credit access**,** thereby increasing their perceived usefulness and encouraging adoption among SMEs.

TAM enables SMEs to adopt digital finance tools, granting them access to a wide range of financial services such as credit**,** savings, and payment solutions**.** These tools also help SMEs expand

their market reach through e-commerce and online transactions while enhancing financial record-keeping and decision-making (Disse, & Sommer, 2020). This suggests that, within the TAM framework, SMEs are more likely to recognize the advantages of these technologies, promoting broader financial inclusion and better business performance. In conclusion, the Technology Acceptance Model serves as a roadmap for increasing SMEs' adoption of digital finance by addressing their perceptions of usefulness and ease of use. By integrating digital literacy programs and customized digital finance solutions, stakeholders can drive financial inclusion, enabling SMEs to overcome traditional financial barriers and succeed in the digital economy.

Institutional Theory (Scott, 1995)

Institutional Theory provides a framework for understanding how institutions—comprising regulative, normative, and cultural-cognitive elements—shape and constrain organizational behavior and social systems. The theory highlights that institutions establish the rules, norms, and beliefs that guide actors toward achieving legitimacy and maintaining stability in their environments (Dyson, & Hodgson (2016). This theory offers valuable insights into how digital finance and digital literacy contribute to these objectives, emphasizing the role of institutional elements in shaping adoption and usage patterns (Evans, 2018).

For instance, Institutional Theory underpins the creation of regulatory frameworks that support the development of digital financial platforms, such as mobile money and online banking, by ensuring security, privacy, and compliance. Policies like subsidies for digital devices or reduced transaction costs further encourage participation among underserved populations. Financial regulations also foster trust in digital systems, which is essential for their widespread adoption and long-term sustainability.

Ghosh, & Bhattacharya (2019) assert that Institutional Theory highlights how social norms about financial independence and economic participation drive individuals to adopt digital finance tools. Advocacy by community leaders or organizations promoting digital literacy plays a pivotal role in reshaping societal attitudes toward technology and finance. Additionally, digital finance service providers align their offerings with local values and practices to enhance relevance and acceptance within communities. According to Gabor, and Brooks, (2017), the theory supports the implementation of digital literacy programs, which help individuals understand and trust digital finance systems while addressing fears and misconceptions about technology. Shared beliefs about financial empowerment create a culture that fosters technology adoption. Innovations such as localized user interfaces and support for vernacular languages resonate with existing cultural-cognitive frameworks, making digital finance more accessible and widely accepted.

Similarly, Grohmann et al. (2018) emphasize that Institutional Theory provides a robust framework for supporting the growth of mobile financial services in Nigeria, including platforms such as Firstmonie, PalmPay, Moniepoint, eNaira, Cowrywise, OPay, Paystack, and Paga. The growth of these platforms is driven by increasing smartphone penetration, regulatory reforms, and the overarching goal of expanding financial inclusion. Institutional Theory underscores the importance of the regulative environment, including laws, policies, and governance structures. For small and medium enterprises (SMEs) in Nigeria, this ensures compliance with financial regulations, such as the Central Bank of Nigeria's policies on digital banking and mobile money. For example, platforms designed for SME financial inclusion can incorporate features for secure transactions, tax compliance, and regulatory reporting, thereby reducing administrative burdens (Gomber et al., 2017). These measures enhance trust in digital platforms, increasing their adoption and enabling SMEs to thrive in a digitally-driven economy.

Digital Finance and Financial Inclusion

Digital finance refers to the delivery of financial services through digital technologies such as mobile devices, online platforms, electronic payment systems, and digital currencies. It encompasses a broad range of services, including mobile banking, digital wallets, online payment systems, peer-to-

peer lending, and digital investments. According to Heeks (2016), digital finance enables individuals and businesses to access, manage, and utilize financial services conveniently, efficiently, and often at a lower cost compared to traditional financial methods. Existing research establishes that digital finance plays a transformative role in advancing financial inclusion by addressing the barriers that have historically excluded large segments of the population (SMEs) from accessing financial services (Heeks, 2017; Kabakova, & Plaksenkov, 2018). To support this assertion, Kapadia (2019) proves that digital finance reduces geographic and physical barriers by enabling SMEs to access financial services through mobile devices and online platforms, even in remote areas.

Similarly, Mader (2018) demonstrates that by leveraging technology, digital finance lowers the cost of providing and accessing financial services, making them more affordable for low-income populations. In another study, Kim et al. (2018) attest that digital financial tools offer real-time access to financial services, enabling faster transactions and easier management of personal and business finances. Kimmitt and Munoz (2017) believe that the development of products such as mobile money, digital wallets, and micro-lending platforms tailored to the needs of underserved populations fosters greater participation in the financial system. Yang and Zhang (2020) demonstrated that digital finance tools, including mobile banking, digital wallets, online payment systems, peer-to-peer lending, and digital investments, have a significant association with the financial inclusion of SMEs in China. Similarly, Shofawati (2019) found that digital finance strongly predicts the financial inclusion of SMEs in Indonesia. Barnard et al. (2020) also confirmed that digital finance serves as a critical determinant of SME financial inclusion in London. In Sri Lanka, Thathsarani and Jianguo (2022) established that digital finance creates opportunities for financial inclusion among small businesses. In Uganda, Rennie et al. (2024) reaffirmed that digital finance is a foundational pillar for SME financial inclusion. Studies in Morocco and Kenya by Ed-Daoudy and Chakir (2024) and Kambi and Onyiego (2022), respectively, further reconfirmed that digital finance provides consistent financial support, fostering the growth and development of SMEs in these countries. In line with this perspective, the Resource-Based View (RBV) theory confirms that investing in training programs to improve SMEs' digital literacy fosters the effective utilization of digital finance tools (Donald, 2020). Similarly, Bongomin et al. (2018) assert that the Technology Acceptance Model (TAM) offers a framework to help SME operators overcome barriers to financial inclusion by leveraging digital finance platforms. Furthermore, Institutional Theory emphasizes that promoting the growth of mobile financial services such as Firstmonie, PalmPay, Moniepoint, eNaira, Cowrywise, OPay, Paystack, and Paga can significantly enhance financial inclusion among SME operators (Grohmann et al., 2018). These findings collectively suggest that digital finance accelerates the achievement of financial inclusion goals, driving economic empowerment, reducing inequality, and promoting sustainable development. Based on this, the following hypothesis is proposed:

H1: Digital finance is associated with the financial inclusion of SMEs.

The mediating factor of Digital Literacy

Digital literacy is the ability to effectively access, understand, evaluate, and use digital technologies for purposes such as communication, problem-solving, and financial management. It involves skills like navigating digital platforms, understanding digital tools, ensuring cybersecurity, and applying these technologies to meet personal or business needs. For SMEs, digital literacy is crucial for adopting and utilizing digital tools that enhance operations, improve financial management, and foster growth (Klapper, & Lusardi (2020). Li et al. (2020) highlight that digital finance relies on platforms, tools, and technologies such as mobile banking apps, online payment systems, and digital wallets. However, the success of digital finance depends on users' ability to understand and utilize these tools effectively, making digital literacy a critical factor. Supporting this view, Morakanyane et al. (2017) emphasize that digital literacy enables SME owners to overcome fears and misconceptions about technology, adopt digital financial tools, and navigate digital platforms effectively. This capability helps SMEs conduct transactions, monitor finances, and access financial services seamlessly.

In a related study, Rennie et al. (2024) affirm that digital literacy empowers SMEs to utilize advanced digital financial tools like online credit applications, digital accounting systems, and peer-to-peer lending platforms. Similarly, Manzoor (2021) attests that digital literacy helps SMEs overcome barriers such as distance and inadequate physical infrastructure by enabling access to a broader range of financial services available on digital platforms. Rasheed et al. (2019) further observe that digitally literate SMEs are more likely to engage with formal financial institutions, transitioning from cash-based or informal systems to digital financial ecosystems. This equips SMEs with the knowledge needed to make informed decisions and improve financial management. Alfonso and Masato (2022) argue that digital literacy addresses cultural and educational challenges, particularly in rural and underserved areas, fostering financial inclusion. Kangyu et al. (2023) support this by noting that SMEs with digital literacy are more likely to sustain the use of digital finance tools, ensuring long-term integration into the financial system. Gu et al. (2023) add that digital literacy enables SMEs to adopt digital financial tools more easily, enhancing access to formal financial systems. Beyond adoption, digital literacy ensures consistent and effective use of digital financial services, maximizing their benefits for SMEs while building trust in financial technologies. Similarly, Kulathunga et al. (2020) assert that digital literacy enables SMEs to access wider markets through e-commerce platforms, thereby increasing revenue and strengthening financial capacity. Tuffour et al. (2020) further demonstrate that digital literacy facilitates the integration of digital payment options, such as QR codes and mobile money, which attract more customers and improve cash flow. In the same vein, Gathungu and Sabana (2018) argue that digital literacy empowers SMEs to evaluate and choose cost-effective digital finance solutions, reducing their dependence on costly informal financial services. Agyapong (2020) supports these findings, emphasizing that digital literacy allows SMEs to bypass intermediaries, lowering transaction costs and boosting net financial gains. Wei et al. (2023) add that digitally literate SMEs are more likely to engage in online training and workshops, keeping them informed about emerging digital finance products. Similarly, an et al. (2024) highlight that digitally literate SME owners can share their knowledge with peers, creating a ripple effect that promotes the broader adoption of digital financial tools across the SME sector.

This evidence highlights digital literacy as a critical foundation for integrating SMEs into the digital financial ecosystem and advancing financial inclusion. By equipping SME owners with the skills to understand, trust, and effectively use digital financial tools, digital literacy ensures that digital finance initiatives lead to meaningful and sustainable outcomes. Therefore, the following hypotheses emerge:

H2: Digital literacy has a direct link with the digital finance of SMEs

H3: Digital literacy has a direct link with the financial inclusion of SMEs

H4: Digital literacy mediates between digital finance and financial inclusion of SMEs

Conceptual Framework for the Study

Drawing from a comprehensive review of the literature, a conceptual model has been developed to depict the mediating role of digital literacy in the relationship between digital finance and financial inclusion.

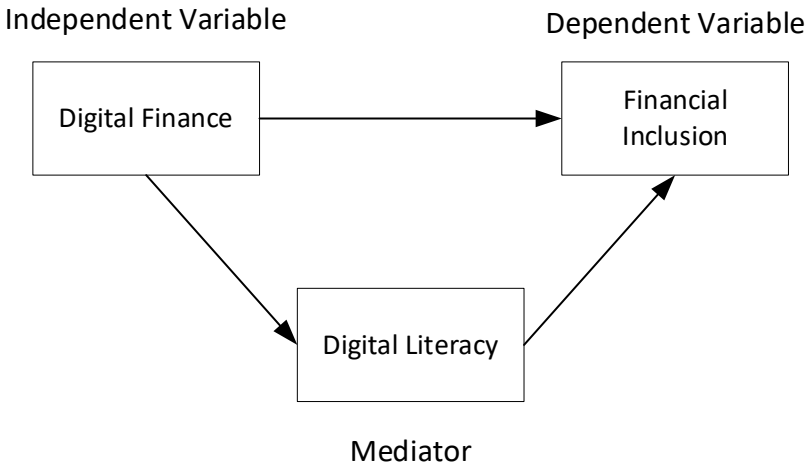

Figure 1: Conceptual Model

Figure 1 illustrates a conceptual model that predicts Financial Inclusion based on digital finance and digital literacy. The model highlights the mediating role of digital literacy in the relationship between digital finance and financial inclusion. This section presents the hypotheses and framework, emphasizing the potential of digital literacy and digital finance to equip SMEs with the skills to navigate digital platforms and provide access to innovative financial services. Digital literacy empowers SMEs with the skills needed to effectively navigate and utilize digital platforms. This proficiency enhances their ability to engage with online banking, mobile money, and fintech solutions for transactions, accessing credit, and managing cash flow. Likewise, digital finance facilitates access to loans through alternative credit scoring methods, streamlines transactions via digital wallets and online banking, and broadens market reach through cross-border payment systems.

Additionally, it minimizes dependence on traditional banking infrastructure, making financial services more accessible to underserved areas and improving financial management. We propose a direct relationship between digital finance and financial inclusion, along with an indirect relationship where digital finance influences financial inclusion through the mediating role of digital literacy.

3. Methodology

This study employed a questionnaire-based data collection method, targeting SME CEOs operating in the Agro-allied, Manufacturing, Education, and Construction sectors. These enterprises were chosen based on their significant contribution to Nigeria's economic growth and development. The selected SMEs, located in Oyo State, have been operational for over 10 years and are registered with SMDAN. From September 14 to November 25, 2024, 350 questionnaires were distributed to respondents who volunteered to participate in the study, with the assistance of two research assistants. A total of 298 questionnaires were returned, yielding a response rate of 85%. This study incorporated three constructs: (1) digital finance, (2) digital literacy, and (3) financial inclusion, each measured using multiple items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Digital Finance (DF) Scale: This multidimensional scale, developed by Yang and Zhang (2020), assesses key aspects of digital finance, including mobile banking, digital wallets, online payment systems, and peer-to-peer lending. Sample items include: *"Mobile banking simplifies the financial transactions of my business," "Using mobile banking reduces the costs associated with traditional banking for my business," "Digital wallets make it easier for my business to receive payments from customers," "The use of online payment systems has positively impacted the revenue of my business," "Online payment systems provide reliable and uninterrupted services for my business," "Peer-to-peer lending platforms provide easy access to funding for my business needs," and "Peer-to-peer lending offers flexible loan*

terms suitable for my business." The scale demonstrates strong reliability, with a reported Cronbach's Alpha coefficient of 0.81 and composite reliability of 0.82.

Digital Literacy Scale: Adapted from Barnard et al. (2020), this 5-item scale measures perceptions of the importance of digital literacy and its role in enhancing access to finance within SMEs. Sample items include: *"Our business has the necessary digital skills to effectively utilize technology for daily operations," "Our business has access to reliable digital tools and platforms to support its activities," "Our business can quickly adapt to new digital technologies and innovations," "We are proficient in applying digital knowledge to enhance productivity and decision-making," and "Our business effectively uses digital platforms to access financial services and resources."* The scale reports a Cronbach's Alpha coefficient of 0.82 and composite reliability of 0.87.

Financial Inclusion Scale: Adapted from Odetayo et al. (2021), this scale evaluates access, usage, and the quality of financial services available to SMEs. Sample items include: *"Our business can easily access loans or credit facilities from financial institutions," "The cost of accessing financial services is affordable for our business," "Our business maintains an active account with a formal financial institution," "Our business utilizes digital financial platforms for transactions and payments," "The financial services we use ensure the security of our transactions and funds," "Our business location does not hinder access to financial services," and "Our business has access to formal savings and investment facilities."* The scale has strong reliability, with a Cronbach's Alpha coefficient of 0.84 and a composite reliability of 0.89.

Measurement Model Assessment

The evaluation of the measurement model is a crucial step in determining the model's feasibility and confirming its alignment with the research data, as presented in Table 1.

Table 1: Evaluation of Research Instruments

Variable	Item	Cronbach's Alpha coefficient	Composite reliability	Source
Digital Finance	DFQ1 DFQ2 DFQ3 DFQ4 DFQ5 DFQ6 DFQ7 DFQ8 DFQ9 DFQ10	0.853	0.819	Yang and Zhang (2020)
Digital Literacy	DLQ1 DLQ2 DLQ3 DLQ4 DLQ5 DLQ6 DLQ7 DLQ8 DLQ9	0.835	0.827	Barnard et al. (2020)
Financial Inclusion	FIQ1 FIQ2 FIQ3 FIQ4 FIQ5	0.827	0.830	

	FIQ6 FIQ7 FIQ8 FIQ9 FIQ10 FIQ11	Odetayo et al. (2021)

Table 1 provides an assessment of the research instruments used in this study.

Digital Finance: A Cronbach's Alpha of 0.853 indicates excellent internal consistency among the items measuring Digital Finance, confirming that the scale items are both reliable and closely interrelated. The Composite Reliability (CR) of 0.819 further validates the reliability of the construct by capturing the variance in the latent variable. This highlights the Digital Finance scale as a robust tool for evaluating its dimensions within SMEs. Researchers can reliably use this scale to measure perceptions of digital financial services such as mobile banking, digital wallets, and peer-to-peer lending.

Digital Literacy: With a Cronbach's Alpha of 0.835, the Digital Literacy scale demonstrates strong internal consistency, ensuring that its items effectively measure the construct. A CR of 0.827 supports the overall reliability and coherence of the scale in capturing the latent variable. This suggests that the scale is highly suitable for assessing SMEs' digital skills, adaptability to new technologies, and their use of digital tools in business operations. Furthermore, the construct underscores the critical role of digital literacy in enhancing access to financial services and driving productivity improvements.

Financial Inclusion: A Cronbach's Alpha of 0.827 reflects high internal consistency among the items measuring Financial Inclusion, ensuring the reliability of the scale. The CR of 0.830 confirms that the construct adequately captures the variance of the latent variable, further affirming its reliability. This makes the Financial Inclusion scale a dependable instrument for assessing SMEs' access to financial services, affordability of these services, and their utilization for business growth. It is well-suited for analyzing financial accessibility and its influence on SME performance.

Conclusion: The evaluation shows that all three constructs—Digital Finance, Digital Literacy, and Financial Inclusion—exhibit strong reliability, with Cronbach's Alpha and CR values exceeding 0.8. This confirms that the scales are reliable and valid tools for SME-related research. Future studies can confidently apply these scales to investigate the interplay between digital adoption, financial accessibility, and SME outcomes, such as performance and innovation.

Data Analysis

This study utilized a quantitative research methodology to explore explanatory questions and evaluate the proposed hypotheses. Path Analysis Structural Equation Modelling (PA-SEM) served as the primary statistical approach for data analysis. PA-SEM is highly regarded for its capacity to analyse complex models involving multiple constructs, indicator variables, and structural paths while accommodating real-world data without strict distributional requirements (Hair et al., 2019). The analysis was conducted using STATA software, version 15.

Socio-demographic Characteristics

The demographic information included gender, age, level of education and years in operation and sector of business. This is depicted in Table 1:

Table 2. Socio-demographic characteristics of the respondents

Characteristics	**Frequency**	**Percentage**
Gender		
Male	199	66.8

Female	99	33.2
Total	298	100.0
Age (in years)		
< 21	8	2.6
21-30	28	9.3
31-40	98	32.8
>40	164	55.3
Total	298	100.0
Level of Education		
Vocational Training	62	20.8
National Diploma	80	26.8
Bachelor	114	38.2
Masters	42	14.2
Total	298	100.0
Sector		
Agro-allied	52	17.4
Manufacturing	105	35.3
Education	98	32.8
Construction	43	14.5
Total	298	100.0

Table 2 provides a detailed demographic profile of the respondents, highlighting key characteristics of the surveyed SMEs. The majority of respondents (66.8%) are male, reflecting a common trend in many regions globally. This underscores the need to design targeted digital literacy programs to empower women entrepreneurs and reduce gender disparities. Financial institutions should also ensure their digital products and services are user-friendly and accessible to women, addressing the unique challenges they may face in the digital space. The age distribution of respondents is relatively balanced, with a significant proportion falling within the 31–40 age group. This calls for digital literacy initiatives tailored to different age demographics. For instance, younger entrepreneurs might benefit from training on social media marketing and e-commerce strategies, while older entrepreneurs may require foundational guidance on basic computer skills and online banking.

A substantial number of respondents hold a bachelor's degree or higher, indicating a relatively well-educated entrepreneurial cohort. This suggests an opportunity to introduce advanced digital tools such as data analytics, artificial intelligence, and automation to help SMEs optimize operations and make data-driven decisions. Respondents are spread across diverse sectors, including agro-allied, manufacturing, education, and construction. This diversity highlights the need for sector-specific digital solutions. For example: Agricultural SMEs could benefit from digital platforms offering market information and supply chain management tools. Manufacturing SMEs might require tools for

inventory management and quality control. Educational SMEs could explore e-learning platforms, while construction SMEs might adopt project management software tailored to their needs.

For SMEs to succeed in the digital economy, acquiring foundational digital skills such as basic computer usage, internet navigation, and email communication is essential. Integrating digital literacy with financial literacy is equally critical, enabling SMEs to make informed financial decisions and effectively manage their resources. This approach can drive the adoption of mobile banking and payment solutions for seamless financial transactions, support online lending platforms for easy credit access, and provide tools to help SMEs track expenses, manage cash flow, and utilize data for strategic decision-making. By prioritizing digital literacy and promoting digital financial services, SMEs can overcome barriers to financial inclusion and unlock sustainable growth opportunities in the digital age.

Hypotheses testing

The relationship between digital finance and financial inclusion as hypothesized was examined using the SEM analysis. (see Table 2)

Table 3: Path Analysis Structural Equation Modelling (Direct Effect)

Relationship between variables	Estimates	S.E	t-value	p-value
DF → *FI*	.475	.099	5.09	0.000
DF → *DL*	.397	.089	4.99	0.000

Note: DF = Digital finance, DL = Digital literacy, FI = Financial inclusion

Table 3 presents the path coefficient results, indicating a direct relationship between digital finance and financial inclusion (β = 0.475, t = 5.09). The p-value of 0.000 further confirms that digital finance is significantly associated with financial inclusion. Additionally, the path analysis reveals a positive and significant connection between digital finance and digital literacy (β = 0.397, t = 4.99; p = 0.000). These findings suggest that digital finance plays a foundational role in enhancing SMEs' digital literacy and promoting financial inclusion. This study supports the findings of Yang and Zhang (2020), who assert that digital finance tools such as mobile banking, digital wallets, online payment systems, peer-to-peer lending, and digital investments are significantly associated with the financial inclusion of SMEs. Similarly, Shofawati (2019) demonstrated that digital finance is a strong predictor of financial inclusion for SMEs. In another study, Barnard et al. (2020) confirmed that digital literacy is a key determinant of SMEs' engagement with digital finance. Thathsarani and Jianguo (2022) also highlighted that digital literacy fosters opportunities for digital finance among small businesses. Likewise, Rennie et al. (2024) reinforced the idea that digital literacy is a foundational pillar for SME digital finance. Therefore, both H1 and H2 are supported.

Table 4: Mediating effect of digital literacy on digital finance and financial inclusion

Relationship between variable	Estimates	S.E	t-value	p-value	Hypothesis	Remark
Direct Model						
DF → *FI*	.475	.099	5.09	0.000	H_1	Supported
DF → *DL*	.397	.089	4.99	0.000	H_2	Supported
DL→ FI	.366	.075	4.84	0.000	H_3	Supported
Indirect Model						
DF → DL → FI	.898	.086	12.78	0.000	H_4	Partially supported

Table 4 demonstrates the mediating effect of digital literacy between digital finance and financial inclusion. The results show that digital finance significantly influences financial inclusion (β = 0.475, p = 0.000). Additionally, digital literacy was found to have a significant impact on financial inclusion (β = 0.366, p = 0.000). These findings suggest that both digital finance and digital literacy are key predictors of financial inclusion for SMEs. Further analysis in Table 3 reveals that the inclusion of digital literacy as a mediator increased the beta value from 0.475 to 0.898, indicating a stronger relationship between digital finance and financial inclusion. Based on the SEM analysis, this supports the conclusion that digital literacy meets the criteria for a mediating variable. The bootstrapping test [(0.475 * 0.898) = 0.427] further confirms that digital literacy acts as a mediator. This suggests that digital literacy partially mediates the relationship between digital finance and financial inclusion in SMEs. These results align with the mediation guidelines proposed by Zhao et al. (2010) and Baron and Kenny (1986), which state that partial mediation occurs when both the independent variable and the mediator are predictors of the dependent variable. Thus, H_4 is partially confirmed.

This finding implies that SME owners or CEOs with higher levels of digital literacy are more likely to effectively engage with digital finance, thereby enhancing their financial inclusion. SMEs stand to benefit from the combined adoption of digital finance and digital literacy. However, the role of digital literacy as a partial mediator suggests that while SMEs are utilizing digital finance, their full potential for financial inclusion may depend on improving digital literacy. As a result, SMEs with stronger digital literacy are better positioned to achieve greater financial inclusion through more effective use of digital finance tools.

5. Conclusion

The study explores the mediating effect of digital literacy on digital finance and financial inclusion of SMEs in Oyo State Nigeria. Evidence showcases that digital literacy plays a significant mediating role in the relationship between digital finance and financial inclusion for SMEs. Both digital finance and digital literacy were found to significantly influence financial inclusion, with the inclusion of digital literacy as a mediator strengthening the link between digital finance and financial inclusion. This partial mediation effect, confirmed by bootstrapping analysis, underscores the importance of digital literacy in enhancing the impact of digital finance on financial inclusion. The results suggest that SMEs with higher levels of digital literacy are better positioned to effectively engage with digital finance tools, leading to improved financial inclusion. However, the partial mediation effect also indicates that while digital finance adoption is beneficial, SMEs can only fully leverage its potential for financial inclusion by improving their digital literacy. Thus, SMEs that invest in developing digital skills will be able to utilize digital finance tools more effectively, which will enhance their financial inclusion and overall business success. In conclusion, the study highlights the critical role of digital literacy in enabling SMEs to fully benefit from digital finance, ultimately promoting greater financial inclusion and positioning them for success in the digital economy.

Theoretical Implications

The study underscores the significance of the Resource-Based View (RBV), Technology Acceptance Model (TAM), and Institutional Theory in advancing SMEs' financial inclusion.

The RBV highlights digital literacy as a strategic resource that SME owners can leverage to access digital finance tools, overcome traditional banking barriers, and enhance financial inclusion. SME operators are encouraged to develop digital skills, while policymakers can invest in training programs and foster environments that promote the adoption of digital financial solutions. The TAM emphasizes the critical role of digital literacy in shaping SME operators' perceptions of digital finance. SMEs are

more inclined to adopt digital finance platforms when they perceive them as both useful and user-friendly. Policymakers can support this by designing accessible digital finance solutions and offering training programs that build SMEs' confidence in using these platforms effectively. Institutional Theory underscores the importance of a supportive regulatory environment for driving digital finance adoption. SME operators must understand and comply with digital finance regulations to ensure secure and effective usage of these platforms. Policymakers, in turn, can establish frameworks that lower transaction costs, safeguard privacy, and foster trust in digital financial systems. Initiatives such as localized training programs and community advocacy can further help SMEs overcome scepticism, integrate digital finance into their operations, and align with cultural and societal norms.

Integrating digital finance and digital literacy is pivotal for enhancing SMEs' financial inclusion and competitiveness. By leveraging the insights from RBV, TAM, and Institutional Theory, SME operators and policymakers can implement strategic measures to build a robust digital ecosystem. This ecosystem can support sustainable growth, foster financial empowerment, and enable SMEs to thrive in the digital economy.

Practical Implications

The study offers several practical implications for SME owners and managers, financial institutions, and policymakers: For SME Owners and Managers, SMEs should prioritize building digital literacy among their operators and employees. Enhanced digital skills enable the effective use of digital finance tools such as mobile money, online banking, and payment platforms. This, in turn, boosts financial inclusion, operational efficiency, access to credit, and overall business performance. To remain competitive in the digital economy, SMEs should actively pursue digital skills training and adopt appropriate digital tools. Financial Institutions, financial institutions should play a vital role in supporting SMEs by developing user-friendly digital finance solutions tailored to their specific needs. Simplified onboarding processes, intuitive interfaces, and multilingual support can help lower barriers to adoption. Collaborating with SME support organizations to deliver digital literacy training programs can further enable SMEs to maximize the benefits of digital financial services. Moreover, financial institutions should actively promote the advantages of digital finance to foster trust and drive adoption among SMEs. Policymakers should focus on initiatives that enhance digital literacy among SMEs. This includes funding and creating training programs, especially in underserved areas, to equip SME operators with the necessary skills to utilize digital finance tools effectively. Establishing regulatory frameworks that encourage innovation, ensure data security, and foster trust in digital finance systems is essential. Policymakers can also offer incentives such as tax benefits for adopting digital tools and subsidies for acquiring digital devices. By addressing systemic barriers, policymakers can empower SMEs to achieve greater financial inclusion and contribute to sustainable economic growth.

Limitations and Suggestions for Further Study

Like all studies, this one has certain limitations that should be considered. First, the study employed a quantitative research methodology, which, while effective for analyzing statistical relationships, may lack the depth of insight that a qualitative approach could provide. Future research could incorporate qualitative methods to gain a richer understanding of the factors critical to SMEs' financial inclusion. Second, the study was grounded in the Resource-Based View (RBV), Technology Acceptance Model (TAM), and Institutional Theory. While these frameworks provided valuable insights, exploring other theoretical perspectives, such as the Capability Approach, Diffusion of Innovation Theory, or Financial Intermediation Theory, could yield additional findings. Further studies might also examine the role of other factors as moderating variables to deepen understanding. Third, the research utilized non-probability sampling techniques and had a relatively small sample size due to some respondents'

reluctance to participate. These limitations may affect the generalizability of the findings. To address this, future research could expand the sample size and apply probability sampling methods. Additionally, conducting similar studies in other states or countries would help assess the generalizability of the results across diverse cultural and economic contexts.

Despite these limitations, the study provides valuable insights into the factors influencing SMEs' financial inclusion and offers a foundation for further exploration in this field.

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