MODERATING EFFECT OF FINANCIAL LITERACY ON THE RELATIONSHIP BETWEEN FINANCIAL TECHNOLOGY AND FINANCIAL INCLUSION IN GOMBE STATE, NIGERIA

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ABSTRACT

This paper investigates the moderating effect of financial literacy on the relationship between financial technology and financial inclusion among small and medium enterprises (SMEs) in Gombe State, Nigeria. Anchored on the Technology Acceptance Model (TAM), the study adopts a cross-sectional survey design. A total of 290 questionnaires were administered to registered SMEs across the three senatorial zones of Gombe State, of which 264 were correctly completed and deemed usable for analysis, representing a response rate of approximately 91 percent. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that FinTech adoption has a positive and statistically significant effect on financial inclusion, indicating that digital financial platforms enhance SMEs' access to and usage of formal financial services. Financial literacy also exerts a significant positive influence on financial inclusion, highlighting its role in improving SMEs' ability to engage effectively with financial products. Importantly, the interaction between FinTech and financial literacy is positive and significant, confirming the presence of a moderating effect. However, the magnitude of this effect is relatively modest, suggesting that while financially literate SMEs benefit more from FinTech adoption, contemporary digital financial services remain broadly accessible even to enterprises with limited financial knowledge. The findings underscore the need for integrated policy approaches that combine FinTech expansion with targeted financial literacy interventions to achieve more inclusive and sustainable SME financial participation in Nigeria and comparable emerging economies.

Keywords*: Financial Inclusion, Financial Technology, Financial Literacy, Small and Medium Enterprises*
JEL Classification Code: G21, G23, G28, O16, O33

1.0   Introduction

Financial inclusion has become a central pillar of global development policy due to its capacity to promote inclusive economic growth, reduce poverty, and enhance economic resilience. It broadly refers to the access to and effective use of affordable, appropriate, and quality financial products and services by individuals and businesses (World Bank, 2022). At the microeconomic level, financial inclusion enables households and firms to save securely, invest productively, manage risks, and smooth consumption, while at the macroeconomic level it supports financial deepening, efficient allocation of resources and long-term economic growth (Sahay et al., 2020; Demirgüç-Kunt et al., 2022). Consequently, financial inclusion is widely recognized as a critical enabler of several Sustainable Development Goals, including poverty eradication, reduced inequality, and inclusive economic participation (United Nations Secretary-General's Special Advocate for Inclusive Finance for Development, 2018). Despite sustained global efforts, financial inclusion outcomes remain uneven, particularly in developing economies where structural, institutional, and socio-economic barriers persist

(Demirgüç-Kunt et al., 2022). In response, financial technology has emerged as a transformative mechanism for expanding financial access by leveraging digital platforms such as mobile banking, agent banking, Unstructured Supplementary Service Data based services, and digital payment systems (Arner et al., 2020).

In Nigeria, financial inclusion has remained a major policy priority for over a decade. The Central Bank of Nigeria introduced the National Financial Inclusion Strategy in 2012 with the objective of reducing financial exclusion to 20 percent of the adult population. Although progress has been recorded, recent evidence indicates that inclusion gains remain uneven. Data from the 2023 Access to Finance Survey conducted by Enhancing Financial Innovation and Access show that approximately 74 percent of Nigerian adults were financially included in 2023, leaving about 26 percent still excluded from the formal and informal financial system (Enhancing Financial Innovation and Access, 2023). While this represents an improvement over earlier years, the persistence of exclusion highlights deep-rooted disparities across income, education, gender and geography, with northern and rural areas continuing to lag behind southern and urban regions (Allen et al., 2021; Ozili, 2023).

These regional disparities are particularly pronounced in the North-East geopolitical zone, where economic activity is predominantly informal and financial infrastructure remains relatively underdeveloped. According to Enhancing Financial Innovation and Access (2023), approximately 47 percent of adults in the North-East remain financially excluded, a rate significantly higher than the national average and markedly above exclusion levels in southern zones such as the South-West, where exclusion is estimated at below 10 percent. Gombe State exemplifies this challenge. Although digital financial services such as mobile banking, agent banking, and electronic payment platforms are increasingly available, small and medium enterprises in the state continue to exhibit low adoption and limited usage of formal financial services (Ozili, 2023). Small and medium enterprises constitute a critical segment of Gombe State's economy, yet many rely on cash-based transactions and informal financing arrangements, restricting access to credit, savings opportunities and financial risk-management tools. This persistent exclusion suggests that the presence of digital financial technologies alone may be insufficient to ensure meaningful financial participation (Sahay et al., 2020). Enterprise-level capabilities especially financial literacy are increasingly recognized as essential for enabling the effective use of digital financial services (Morgan & Trinh, 2021).

However, empirical evidence on whether financial literacy enhances financial inclusion directly and conditions the effectiveness of financial technology remains limited in Gombe State Nigeria. Therefore, this paper addresses this gap by examining the effects of financial technology on financial inclusion among small and medium enterprises in Gombe State, with particular emphasis on the moderating role of financial literacy.

2.0   Literature Review

2.1   Conceptual Literature Review

2.1.1   Financial Inclusion

Financial inclusion is conceptually understood as a multidimensional construct that goes beyond access to financial services to encompass usage, quality, and welfare outcomes. The World Bank (2022) defines financial inclusion as access to and use of affordable, appropriate, and quality financial products and services that meet individuals' and businesses' needs. Contemporary literature emphasizes that meaningful inclusion requires not only physical or digital access to financial services but also regular usage and the capacity to derive tangible economic benefits, such as improved savings behavior, access to credit, risk mitigation, and

enhanced financial resilience. Consequently, financial inclusion is increasingly viewed as an outcome variable reflecting both supply-side availability and demand-side capability.

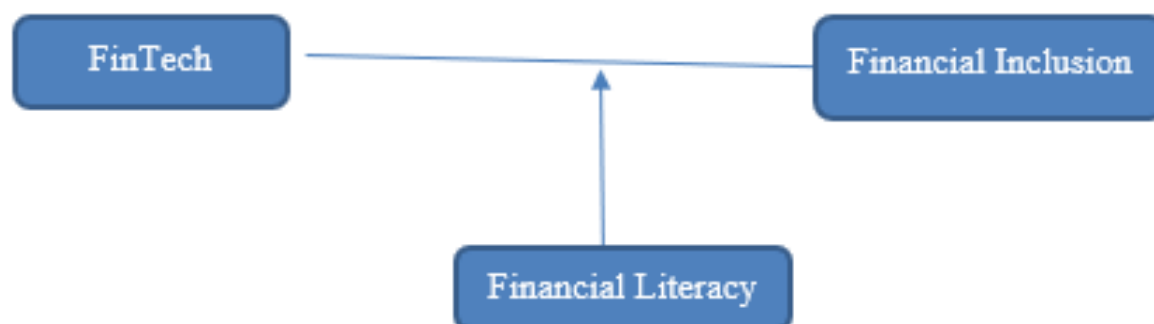### 2.1.2 Financial Technology and Financial Inclusion

Financial technology (FinTech) refers to the deployment of digital innovations to deliver financial services through platforms such as mobile banking, digital wallets, peer-to-peer lending, and agent banking networks (Gomber et al., 2018; Aliano et al., 2024). Conceptually, FinTech is expected to promote financial inclusion by lowering transaction costs, reducing information asymmetries, and overcoming geographic barriers associated with traditional banking systems. By enabling remote account opening, low-cost payments, and digital credit delivery, FinTech expands outreach to previously excluded populations, particularly in developing economies. However, the inclusionary impact of FinTech is not automatic and depends on users' ability to adopt and effectively utilize these technologies.

2.1.3 Financial Literacy as a Conditioning Factor

Financial literacy represents the knowledge, skills, and confidence required to make informed financial decisions, including budgeting, saving, investing, and managing financial risks (Lusardi & Mitchell, 2014). Conceptually, financial literacy enhances individuals' and firms' capacity to understand financial products, evaluate alternatives, and avoid misuse or fraud. In the context of FinTech, financial literacy plays a critical enabling role by improving users' perceptions of digital financial services and their ability to navigate increasingly complex platforms. As such, financial literacy is not only a direct determinant of financial inclusion but also a conditioning factor that can strengthen or weaken the effectiveness of FinTech in promoting inclusion.

2.1.4 Conceptual framework

The research model will be as follows:

2.2 Empirical Literature Review

2.2.1 Financial Literacy and Financial Inclusion

Abdullahi, Ladan, Yusuf and Salisu (2025) investigated the role of financial technology and financial literacy in enhancing financial inclusion among small and medium enterprises (SMEs) in Nigeria. The study collected primary data from 302 SME operators in the Federal Capital Territory and employed descriptive statistics, correlation analysis, and structural equation modeling (SEM) using SmartPLS. Their findings revealed that both FinTech adoption and financial literacy significantly improved financial inclusion, while financial literacy also moderated the relationship between FinTech and financial inclusion, indicating that higher literacy strengthens the benefits of digital financial services. Similarly, Bawa and Abdullahi (2025) examined financial literacy as a moderating factor in the nexus between

FinTech adoption and financial inclusion among SMEs in Northern Nigeria. Using primary survey data from 302 SME operators and PLS-SEM with moderation analysis, they found that both FinTech adoption and financial literacy significantly increased financial inclusion, further confirming that financial literacy enhances the positive effect of FinTech adoption, thereby underscoring the critical role of literacy in realizing digital financial benefits.

In line with these findings, Sam Abugu, Luo, and Wong (2025) explored the combined effect of FinTech innovation and financial literacy on sustainable financial inclusion in Nigeria. By analyzing secondary data from financial inclusion reports and surveys using econometric modeling, they demonstrated that both FinTech adoption and financial literacy significantly determine financial inclusion, with their interaction further strengthening inclusive outcomes, particularly among underserved populations. This aligns with the empirical evidence of Abubakar, Musa, and Bello (2025), who investigated the influence of mobile banking and financial literacy on financial inclusion among rural households in Northern Nigeria. Using primary household survey data and logistic regression analysis, they showed that mobile banking adoption positively affects financial inclusion and that financial literacy significantly moderates this relationship, enabling rural households to effectively use digital platforms and participate more fully in formal financial systems.

2.2.2   Financial Literacy and Financial Inclusion

Ojeh, Udefi, and Nkwo (2025) similarly analyzed how FinTech solutions influence financial inclusion in rural Enugu, Nigeria, considering literacy and infrastructure as determinants of adoption. Through primary survey data and regression analysis, they concluded that while FinTech solutions significantly improve financial access, digital literacy (closely related to financial literacy) and infrastructure availability are critical for maximizing adoption and inclusion, emphasizing the contextual factors necessary for effective FinTech utilization.

Furthermore, Dao Ha (2025) in a systematic literature review of 96 studies from global databases, employed bibliometric and content analysis and found that digital financial services significantly expand financial inclusion worldwide, with financial literacy consistently emerging as a key enabler, especially in developing countries. Extending these findings, Sam Abugu, Luo, and Wong (2025) analyzed secondary data from national financial inclusion surveys using econometric modeling and demonstrated that FinTech innovation significantly contributes to sustainable financial inclusion, particularly among underserved populations. Ojeh, Udefi, and Nkwo (2025) further highlighted that while FinTech solutions improve financial access in rural Enugu, infrastructure and literacy levels remain critical for adoption, indicating that contextual factors may influence the effectiveness of digital financial services.

2.3   Theoretical Framework

This paper is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989). TAM posits that individuals' adoption and use of technology are primarily determined by perceived usefulness and perceived ease of use. In the context of FinTech, these perceptions influence whether individuals and firms are willing to adopt digital financial services.

Financial literacy is theoretically linked to TAM by shaping users' cognitive evaluation of FinTech platforms. Higher levels of financial literacy enhance understanding of financial products and digital interfaces, thereby improving perceptions of usefulness and ease of use. Consequently, financially literate SMEs are more likely to adopt FinTech solutions and leverage them effectively, leading to improved financial inclusion outcomes. Conversely, limited financial literacy may weaken technology acceptance, resulting in underutilization of FinTech services despite access.

The paper is underpinned on Technology Acceptance Model (TAM), developed by Davis (1989), is one of the most widely used theories in explaining how users come to accept and use technology.

2.4   Study Gap

Empirical studies have established that financial technology (FinTech) adoption and financial literacy significantly enhance financial inclusion (Abdullahi, Ladan, Yusuf, & Salisu, 2025; Bawa & Abdullahi, 2025; Abubakar, Musa, & Bello, 2025). Similarly, studies by Sam Abugu, Luo, and Wong (2025), Ojeh, Udefi, and Nkwo (2025) and Dao Ha (2025) underscore the positive role of digital financial services and financial literacy in improving access and usage of financial products. However, research specific to North-Eastern Nigeria, particularly Gombe State, remains limited. Most studies focus on urbanized regions or broader Northern Nigeria, leaving a critical gap in understanding SME-level financial inclusion in semi-urban and rural contexts, where financial exclusion is disproportionately high.

Furthermore, although financial literacy is recognized as a moderating factor in the FinTech - financial inclusion relationship, the practical magnitude and contextual dynamics of this effect remain underexplored. Previous research has largely relied on household-level surveys or secondary datasets, such as the Global Findex Database (Demirgüç-Kunt et al., 2022) and national financial inclusion reports (Yakubu & Yusuff, 2023). While these studies provide valuable macro-level insights, they offer limited understanding of SMEs' capacity to adopt and utilize digital financial services amid infrastructural constraints, informal business practices and varied educational levels.

Therefore, this study addresses this gap by empirically examining the moderating effect of financial literacy on the relationship between financial technology and financial inclusion among SMEs in Gombe State, Nigeria.

3.0   Methodology

3.1   Study Area

Gombe State is located in Nigeria's North-East geopolitical zone, lying between latitudes 9° 30′ and 11° 30′ North and longitudes 10° 45′ and 11° 45′ East. The state shares boundaries with Borno, Yobe, Bauchi, Adamawa and Taraba States and has a projected population of over 3.5 million people, largely youthful and economically active. Major ethnic groups include Hausa, Fulani, Tangale, Waja, Tera, and Bolewa. The paper was conducted among registered Small and Medium Enterprises (SMEs) operating across the three senatorial zones of Gombe State. Gombe North Senatorial Zone comprises Dukku, Funakaye, Gombe, Kwami and Nafada Local Government Areas (LGAs); Gombe Central includes Akko and Yamaltu-Deba LGAs; while Gombe South consists of Balanga, Billiri, Kaltungo and Shongom LGAs. This coverage ensured adequate geographical representation of SMEs across the state.

3.2   Research Design and Data Collection

A descriptive cross-sectional survey research design was adopted. This design enabled the collection of quantitative data from SME owners at a single point in time and supported the application of descriptive and inferential statistical techniques. Primary data were collected using a structured, self-administered questionnaire, administered with the assistance of trained research assistants.

3.3   Population, Sampling Technique, and Sample Size

The paper population comprised all registered Small and Medium Enterprises (SMEs) operating in Gombe State, Nigeria, as obtained from the Gombe State Ministry of Trade and Industry. The total population consisted of 779 registered SMEs. A proportionate stratified random sampling technique was adopted to ensure adequate representation across the study area. Each local government area was treated as a stratum, and samples were allocated proportionately based on the number of registered SMEs in each stratum. This approach minimizes sampling bias and enhances the representativeness of the sample.

Given that the population was finite and known, the minimum required sample size was determined using the Taro Yamane (1967) formula at a 95 percent confidence level and a 5 percent margin of error:

$$N = \frac{N}{1 + N(e)^2}$$

Where n denotes the sample size, N represents the population size, and e is the level of precision.

Substituting the population size (N = 779) and precision level (e = 0.05):

$$n = \frac{779}{1 + 779(0.05)^2}$$

$$n = \frac{779}{1 + 779(0.0025)}$$

$$n = \frac{779}{1 + 1.9475}$$

$$n = \frac{779}{2.9475}$$

$$n \approx 264$$

Thus, the minimum sample size required for the study was 264 SMEs. To mitigate potential non-response and incomplete responses, an additional 10 percent was added to the calculated sample size, resulting in 290 questionnaires being proportionately distributed across the local government areas. Following data screening and validation, 264 correctly completed questionnaires were retained for analysis, representing a response rate of approximately 91 percent.

3.4   Model Specification and Analytical Technique

The analytical model comprised one exogenous latent construct (Financial Technology), one endogenous latent construct (Financial Inclusion) and one moderating latent construct (Financial Literacy). The moderating effect was modeled using an interaction term between financial technology adoption and financial literacy. Formally, the structural model is specified as:

$$FI = \beta_0 + \beta_1 FT + \beta_2 FL + \beta_3 (FT \times FL) + \varepsilon$$

Where FI denotes financial inclusion, FT represents financial technology adoption, FL denotes financial literacy, (FT × FL) captures the moderating effect of financial literacy, β_i are the estimated path coefficients and ε is the error term.

PLS-SEM was selected for several methodological and empirical reasons. First, the study is prediction-oriented and theory-extending rather than theory-confirming, which aligns with the primary objective of PLS-SEM. Second, the model incorporates a moderation effect involving latent interaction terms, which PLS-SEM handles efficiently without imposing strict distributional assumptions. Third, the sample size (n = 264) is relatively modest for covariance-based SEM, whereas PLS-SEM is well-suited for complex models with smaller samples. Fourth, PLS-SEM accommodates non-normal data, a common characteristic of survey responses from SMEs in developing economies. Additionally, the constructs in this study were operationalized as latent variables measured by multiple indicators, necessitating a multivariate technique capable of simultaneously estimating both the measurement model (indicator reliability, internal consistency, convergent and discriminant validity) and the structural model (path relationships and moderation effects). PLS-SEM enables such simultaneous estimation while maximizing explained variance in the endogenous construct.

3.5   Measurement of Variables

The paper examined Financial Inclusion, Financial Literacy, and Financial Technology (Fintech). Measurement items for all constructs were adapted from previously validated empirical studies. Responses were captured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). To test the moderating effect, an interaction term (Financial Literacy × Fintech) was constructed and incorporated into the structural model.

3.6   Data Analysis Procedure

Data analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS version 4.0. The analysis followed a two-stage approach. First, the measurement model was evaluated to assess internal consistency reliability, convergent validity, and discriminant validity using Cronbach's alpha, composite reliability, average variance extracted (AVE), and the Heterotrait–Monotrait Ratio (HTMT). Second, the structural model was assessed to examine the hypothesized direct and moderating relationships among the study variables. Bootstrapping procedures were employed to estimate path coefficients, t-statistics, and p-values, while the explanatory power of the model was assessed using the coefficient of determination (R^2). These analytical procedures are consistent with established PLS-SEM guidelines and align with the empirical results reported in the Results section.

4.0   Results and Discussion

4.1   Demographic Characteristics of Respondents

Out of the 290 questionnaires administered to SME owners across Gombe State, 264 were correctly completed and returned, representing a response rate of 91.0%, which is considered adequate for statistical analysis. Demographic profile of respondents provides important context for interpreting the study findings. The analysis covers respondents' gender, age of respondents, educational qualification, nature of business and business experience. These characteristics offer insight into the background of SME owners and how such attributes may influence financial literacy, fintech adoption, and financial inclusion. The summary of respondents' demographic characteristics is presented in Table 1.

Table 1: Demographic Characteristics of Respondents (N = 264)

Demographic Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	160	60.6
	Female	104	39.4
Age of the respondents	18–25	50	18.9
	26–35	112	42.4
	36–45	68	25.8
	46–55	26	9.8
	Above 55	8	3.0
Educational Qualification	FSLC	14	5.3
	SSCE/WAEC	72	27.3
	NCE/OND	68	25.8
	HND/BSc	84	31.8
	Postgraduate	26	9.8
Nature of Business	Trading	100	37.9
	Agriculture	56	21.2
	Manufacturing	40	15.2
	Services	58	22.0
	Other	10	3.8
Business Experience	< 1 year	18	6.8
	1–3 years	72	27.3
	4–6 years	84	31.8
	Above 7 years	90	34.1

Source: Field Survey, 2025

The demographic profile indicates that male respondents constituted the majority of SMEs in Gombe State (60.6%), while females accounted for 39.4%. This distribution suggests a gender imbalance in SME ownership, reflecting trends in Nigeria where men often dominate entrepreneurial activities. Understanding gender distribution is critical as it may influence financial technology adoption and inclusion patterns among SMEs. The largest age group was 26–35 years (42.4%), followed by 36–45 years (25.8%). The 18–25 group represented 18.9%, while older entrepreneurs (46–55 and above 55) made up 12.8% collectively. The dominance of younger and middle-aged SME owners aligns with previous studies indicating that young adults are more receptive to financial technology innovations.

Regarding education, a significant portion of respondents had HND/BSc qualifications (31.8%), followed by SSCE/WAEC holders (27.3%) and NCE/OND holders (25.8%). Only 9.8% had postgraduate education, and 5.3% had FSLC. This distribution implies that most SME owners possess moderate to high educational levels, which may positively influence their understanding and utilization of financial technology services. Trading was the predominant business type among respondents (37.9%), followed by services (22.0%), agriculture (21.2%), manufacturing (15.2%), and other business types (3.8%). The predominance of trading and service-based businesses suggests that these SMEs may be more likely to engage with fintech solutions for transactions, payments, and financial inclusion. In terms of experience, 34.1% of respondents had over 7 years in business, 31.8% had 4–6 years, 27.3% had 1–3 years, and only 6.8% had less than a year of experience. This indicates that the majority of SMEs have moderate to extensive experience, which could affect their financial literacy levels and the adoption of fintech solutions

4.2   Reliability and Convergent Validity

Before assessing relationships among constructs in the structural model, it is essential to first evaluate the reliability and validity of the measurement model. Reliability examines the internal consistency of items measuring the same construct, while convergent validity

evaluates the extent to which items converge to represent a single underlying concept. According to Hair et al. (2019), acceptable thresholds for measurement quality include Cronbach's alpha ⩾ 0.70, composite reliability (CR) ⩾ 0.70, and average variance extracted (AVE) ⩾ 0.50. Table 2 presents the reliability and convergent validity results.

Table 2: Reliability and Convergent Validity Result

Construct	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	AVE
Financial Inclusion	0.870	0.873	0.903	0.607
Financial Literacy	0.881	0.883	0.910	0.629
Fintech	0.908	0.915	0.929	0.685

Source: Author's Computation using Smart PLS4

The results in table 2 indicate that all constructs meet the recommended thresholds for internal consistency reliability. Cronbach's alpha values for all three constructs Financial Inclusion (0.870), Financial Literacy (0.881), and Fintech (0.908) exceed the minimum criterion of 0.70, confirming strong internal consistency (Nunnally & Bernstein, 1994). Similarly, composite reliability values (ρc), which are considered more accurate, fall between 0.903 and 0.929, surpassing the recommended minimum value of 0.70 (Hair et al., 2019). This demonstrates that the items used to measure each construct consistently reflect the underlying latent variable. In terms of convergent validity, the AVE values for all constructs are above 0.50, with Financial Inclusion (0.607), Financial Literacy (0.629), and Fintech (0.685). These results confirm that more than 50% of the variance in the indicators is explained by the latent construct, establishing adequate convergent validity (Fornell & Larcker, 1981). the findings demonstrate that the constructs used in this study are both reliable and valid, allowing further interpretation of the structural model.

4.3   Discriminant Validity

To further validate the distinctiveness of the constructs in the study, the Heterotrait–Monotrait Ratio (HTMT) matrix is presented below. HTMT is one of the widely recognized reliable method for assessing discriminant (Henseler et al., 2015). The matrix format enables a clearer visual inspection of inter-construct relationships. HTMT values below 0.85 (strict criterion) or 0.90 (liberal criterion) indicate that constructs are sufficiently distinct (Hair et al., 2019). The table below provides the HTMT matrix for Financial Inclusion, Financial Literacy, Fintech, and the interaction term (Financial Literacy × Fintech).

Table 3: Heterotrait Monotrait Ratio (HTMT) Matrix

Construct	1	2	3	4
1. Financial Inclusion	-			
2. Financial Literacy	0.523	-		
3. Fintech	0.511	0.388	-	
4. Financial Literacy × Fintech	0.140	0.151	0.376	-

Source: Authors's Computation using Smart PLS4

The HTMT results in Table 3 indicate that discriminant validity is fully established among all constructs. All HTMT values fall well below the conservative threshold of 0.85, as recommended by Henseler et al. (2015). Specifically, the HTMT value between Financial Inclusion and Financial Literacy is 0.523, while that between Financial Inclusion and Fintech is 0.511, both suggesting a clear distinction between the constructs. The interaction term (Financial Literacy × Fintech) also displays low HTMT values (ranging from 0.140 to 0.376), which further confirms that the moderating construct does not overlap conceptually with the original constructs. These results show that each latent variable measures a unique dimension

of SME financial behavior, ensuring that the relationships examined in the structural model are not biased by multicollinearity or conceptual duplication (Hair et al., 2019). Therefore, the constructs demonstrate strong discriminant validity and can be interpreted independently in the subsequent structural model analysis.

4.4   Hypothesized Relationship (Path Coefficient)

Following the assessment of the measurement model, the structural model evaluation provides insights into the explanatory strength of the model and the significance of the hypothesized relationships. Path coefficients indicate the magnitude and direction of the effects of independent variables on the dependent variable. Table 4 presents

Table 4: Path Coefficients

Path	Coefficient (β)	t-Statistic	p-Val
Financial Literacy → Financial Inclusion	0.339	7.298	0.000
Fintech → Financial Inclusion	0.362	8.292	0.000
Financial Literacy × Fintech → Financial Inclusion	0.034	3.057	0.002
R-Square: 0.319			

Source: Authors's Computation using Smart PLS4

The structural model results indicate that financial literacy has a positive and statistically significant effect on financial inclusion ($\beta = 0.339$, $p < 0.001$). This finding conforms with existing empirical evidence that financially knowledgeable individuals and business owners are better positioned to engage with formal financial services due to improved understanding, confidence, and decision-making capacity (Klapper et al., 2016; Abubakar et al., 2025). It also aligns with recent Nigerian SME studies that identify financial literacy as a critical enabler of financial inclusion, particularly in environments characterized by informational constraints and informal business practices (Abdullahi et al., 2025; Bawa & Abdullahi, 2025).

Similarly, FinTech adoption exhibits a positive and highly significant effect on financial inclusion ($\beta = 0.362$, $p < 0.001$), representing the strongest direct effect in the model. This result strongly aligns with and corroborates the digital finance literature, which consistently finds that FinTech reduces transaction costs, mitigates geographical barriers, and expands access to financial services for underserved populations (Ozili, 2018; Dao Ha, 2025). Comparable findings have been reported in SME-focused studies in Nigeria and other developing economies, confirming that digital platforms such as mobile money, POS terminals, and agent banking play a central role in advancing financial inclusion (Abdullahi et al., 2025; Sam Abugu et al., 2025).

The interaction effect between financial literacy and FinTech adoption is statistically significant but weak ($\beta = 0.034$, $p = 0.002$), indicating that financial literacy moderates the FinTech–financial inclusion relationship with a small effect size. This finding aligns with recent moderation-based SME studies, which also report significant but modest interaction effects (Abdullahi et al., 2025; Bawa & Abdullahi, 2025). However, it partly contrasts with macro-level household studies using secondary datasets, such as the Global Findex Database, which often report stronger literacy effects (Demirgüç-Kunt et al., 2022). The weaker moderation observed in this study suggests that modern FinTech platforms are increasingly intuitive, enabling SMEs with limited financial knowledge to still benefit from digital financial services. Consequently, financial literacy plays a supportive rather than transformative role, enhancing but not fundamentally altering the FinTech–financial inclusion nexus.

The model explains 31.9% of the variation in financial inclusion (R² = 0.319), indicating moderate explanatory power. This level of explanation aligns with similar SME-based FinTech studies, which typically report moderate R² values due to the multidimensional nature of financial inclusion (Hair et al., 2019; Sam Abugu et al., 2025). While other contextual factors may also influence inclusion outcomes, the results validate the theoretical model and confirm the central role of technological and knowledge-based factors. The Model is visualized in the figure below:
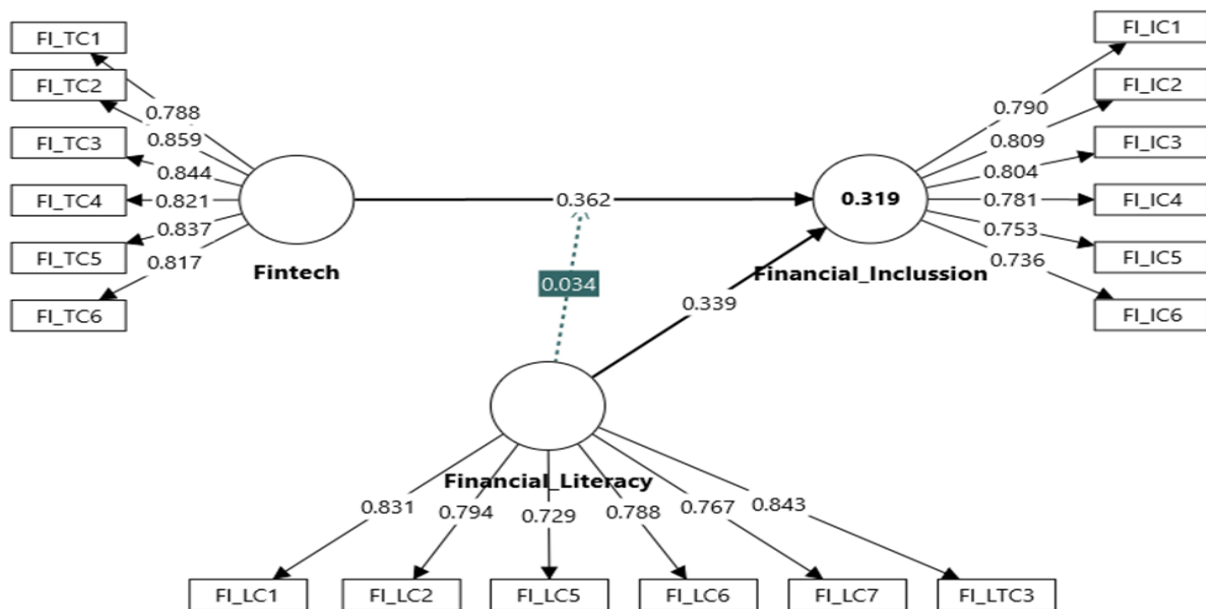

Figure 1: Path Diagram

All the items show a high loading on their respective latent variables as depicted in the figure above. However, items (FI_TC7, FI_LC4 and FI_IC7) were dropped due to low factor loadings.

5.0 Conclusion and Recommendations

5.1 Conclusion

This paper examined the moderating effect of financial literacy on the relationship between financial technology (Fintech) and financial inclusion among Small and Medium Enterprises (SMEs) in Gombe State, Nigeria. Using a cross-sectional survey design and PLS-SEM, the study provides empirical evidence on how digital financial innovations and financial knowledge interact to shape SMEs' participation in the formal financial system.

The findings show that both financial literacy and Fintech have positive and statistically significant effects on financial inclusion. Fintech emerges as the most influential driver, indicating that digital financial platforms substantially reduce access barriers faced by SMEs. Financial literacy also plays an important role by enhancing SME owners' ability to understand and utilize financial services. Moreover, financial literacy is found to significantly moderate the Fintech–financial inclusion relationship, although the magnitude of the moderation effect is weak. This suggests that while financially literate SMEs benefit slightly more from Fintech adoption, contemporary digital financial services are sufficiently user-friendly to promote inclusion even among those with limited financial knowledge.

5.2   Recommendations

The findings have several important policy implications for government, financial regulators, Fintech providers, and SME support institutions in Nigeria and similar emerging economies.

First, policymakers and financial regulators, particularly the Central Bank of Nigeria (CBN) and state-level economic agencies, should continue to promote Fintech-driven financial inclusion strategies. Expanding digital payment infrastructure, strengthening agent banking networks, and improving mobile and internet connectivity especially in semi-urban and rural areas—can significantly enhance SMEs' access to formal financial services.

Second, although Fintech platforms are broadly accessible, the positive role of financial literacy suggests that targeted financial education programmes remain necessary. Government agencies, development partners and SME associations should integrate basic financial literacy training with digital finance initiatives. Such programmes should focus on practical skills, including budgeting, record-keeping, responsible borrowing and digital financial security, rather than complex financial concepts.

Third, Fintech firms and financial institutions should design products that accommodate varying literacy levels among SME owners. Simplified interfaces, local language options, agent-assisted services, and consumer protection mechanisms can further strengthen trust and usability. These measures can help ensure that Fintech adoption translates into sustained and meaningful financial inclusion rather than short-term transactional use.

Fourth, SME development agencies such as SMEDAN and state ministries of commerce should leverage Fintech platforms to deliver credit, grants, and business support services. Embedding financial literacy components within digital lending and payment platforms can enhance SMEs' capacity to manage finance effectively and reduce default risks.

Finally, the moderate explanatory power of the model suggests the need for complementary policies that address non-technical barriers to financial inclusion. Regulatory transparency, institutional trust and socio-cultural factors should be considered in the design of inclusive finance policies to ensure that digital financial innovations achieve their intended developmental outcomes.

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