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The Impact of Fintech on Financial Inclusion in Emerging Economy of Major Cities in Indonesia

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Abstrak

Penelitian ini meneliti pengaruh adopsi teknologi finansial *(FinTech)* terhadap inklusi keuangan di wilayah ekonomi daerah berkembang dengan menggunakan metode *Structural Equation Modeling–Partial Least Squares (SEM-PLS)*. Data dikumpulkan melalui survei terhadap 450 responden dari tiga kota berkembang, yaitu Surabaya, Makassar, dan Medan, untuk mengukur hubungan antara aksesibilitas *FinTech*, literasi keuangan, kepercayaan terhadap platform digital, dan inklusi keuangan. Hasil pengujian model pengukuran menunjukkan tingkat reliabilitas dan validitas yang baik, dengan nilai Cronbach's Alpha berkisar antara 0,84 hingga 0,90 dan *Average Variance Extracted (AVE)* di atas 0,60. Hasil model struktural menunjukkan bahwa aksesibilitas FinTech ($\beta = 0,35$, $p < 0,01$) dan literasi keuangan ($\beta = 0,29$, $p < 0,01$) memiliki pengaruh positif dan signifikan terhadap inklusi keuangan. Kepercayaan terhadap platform *FinTech* juga memberikan kontribusi positif ($\beta = 0,21$, $p < 0,05$) serta berperan sebagai variabel mediasi antara aksesibilitas FinTech dan inklusi keuangan (β tidak langsung = 0,11, $p < 0,05$). Model penelitian ini mampu menjelaskan 62% variansi inklusi keuangan ($R^2 = 0,62$), yang menunjukkan daya jelaskan yang kuat. Temuan ini menegaskan bahwa inovasi *FinTech* tidak hanya meningkatkan akses terhadap layanan keuangan, tetapi juga memperkuat pemanfaatan layanan tersebut secara efektif ketika disertai dengan tingkat kepercayaan dan literasi keuangan yang tinggi. Penelitian ini memberikan kontribusi penting terhadap literatur keuangan digital serta menawarkan rekomendasi praktis bagi pembuat kebijakan untuk mendorong pertumbuhan ekonomi yang inklusif.

Kata Kunci: teknologi finansial, inklusi keuangan, SEM, literasi keuangan

Abstract

This study investigates the impact of financial technology (FinTech) adoption on financial inclusion in emerging economies using Structural Equation Modeling–Partial Least Squares (SEM-PLS). Data were collected through a survey of 450 respondents from three emerging city (Surabaya, Makassar, and Medan) to measure the relationships among FinTech accessibility, financial literacy, trust in digital platforms, and financial inclusion. The measurement model showed good reliability and validity, with Cronbach's Alpha ranging from 0.84 to 0.90 and Average Variance Extracted (AVE) above 0.60. Structural model results indicated that FinTech accessibility ($\beta = 0.35$, $p < 0.01$) and financial literacy ($\beta = 0.29$, $p < 0.01$) have significant positive effects on financial inclusion. Trust in FinTech platforms also contributed positively ($\beta = 0.21$, $p < 0.05$) and acted as a mediator between FinTech accessibility and financial inclusion (indirect $\beta = 0.11$, $p < 0.05$). The model explained 62% of the variance in financial inclusion ($R^2 = 0.62$), suggesting strong explanatory power. These findings confirm that FinTech innovations not only improve access to financial services but also enhance their effective use when combined with higher trust and literacy levels. The study contributes to the digital finance literature and provides practical recommendations for policymakers to promote inclusive growth.

Key words*: financial technology, finance inclusion, SEM, digital finance literature*

INTRODUCTION

Financial inclusion has become a critical agenda for economic development, particularly in emerging economies, where approximately 1.4 billion adults remain unbanked (World Bank, 2022). Limited access to financial services constrains the ability of individuals and small businesses to save, borrow, or invest, thereby slowing down poverty alleviation and economic growth. Traditional banking systems face high operational costs, limited branch penetration in rural areas, and stringent requirements that often exclude low-income populations (Zaniarti et al., 2025).

The rise of financial technology (FinTech) has transformed the financial landscape by introducing innovative digital solutions such as mobile wallets, Peer-to-Peer (P2P) lending platforms, blockchain, and digital payment systems (Turi, 2023). These innovations promise to bridge financial gaps by lowering

transaction costs, improving accessibility, and fostering financial literacy. In Kenya, for example, M-Pesa revolutionized mobile money usage, while in India, the Unified Payments Interface (UPI) has accelerated digital transactions. Similar patterns are observed in Southeast Asia, including Indonesia and Vietnam, where mobile wallets like GoPay, OVO, and MoMo have expanded rapidly (Kshetri, 2025). Despite this growth, several barriers remain. Issues such as digital inequality, cybersecurity risks, lack of financial literacy, and inconsistent regulatory frameworks hinder the effectiveness of FinTech in achieving sustainable inclusion. Moreover, while descriptive evidence suggests that FinTech promotes inclusion, rigorous empirical validation through advanced methods such as Structural Equation Modeling–Partial Least Squares (SEM-PLS) remains limited in emerging market contexts (Girsang and Purnama, 2025).

Despite the rapid growth of FinTech, most prior studies have primarily focused on developed economies, where digital infrastructure and regulatory frameworks are already advanced (Arner, Barberis, & Buckley, 2016; Gomber et al., 2018). Evidence from emerging economies remains fragmented and often descriptive rather than quantitative. For instance, while case studies on Kenya's M-Pesa or India's UPI highlight successful adoption, few empirical works have examined the structural relationships between FinTech accessibility, financial literacy, trust, and inclusion using advanced statistical methods (Flötotto et al., 2022). This gap underscores the need for more systematic and rigorous analyses in developing country contexts.

Moreover, existing research on financial inclusion has often treated FinTech adoption as a direct driver, overlooking the mediating and moderating roles of behavioural and institutional factors such as trust and financial literacy (Lusardi & Mitchell, 2014; Zhang et al., 2021). Without considering these variables, conclusions may overestimate the role of technology alone in fostering financial inclusion. This study addresses the gap by incorporating these constructs into a holistic framework and testing it using Structural Equation Modelling–Partial Least Squares (SEM-PLS).

The purpose of this research is therefore twofold. First, it aims to empirically examine the direct and indirect effects of FinTech accessibility, financial literacy, and trust on financial inclusion in emerging economies. Second, it seeks to validate a comprehensive conceptual framework that integrates technology adoption with behavioural and trust dimensions. The findings are expected to contribute theoretically by extending the literature on digital finance and inclusion, and practically by providing policy insights for governments, financial regulators, and FinTech providers to design more inclusive financial ecosystems.

RESEARCH METHOD

This study employed a quantitative, cross-sectional survey design to examine the relationships between variables. A total of 450 respondents were surveyed across three cities in Indonesia: Surabaya, Makassar, and Medan representing both users and non-users of FinTech applications. Data were collected using a structured questionnaire based on a 5-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The instrument was designed to measure respondents' perceptions and behaviours across four latent constructs: FinTech Accessibility (FA), Financial Literacy (FL), Trust (TR), and Financial Inclusion (FI). To ensure content validity, the questionnaire items were adapted from prior studies and reviewed by academic experts in finance and information systems.

The construct of FinTech Accessibility (FA) was measured using indicators related to ease of access, affordability, and convenience of digital financial platforms. Financial Literacy (FL) was assessed through items reflecting knowledge, skills, and attitudes toward personal financial management. Trust (TR) was captured by indicators of security, privacy, and reliability in using FinTech services. Finally, Financial Inclusion (FI) was operationalized through access, usage, and the perceived quality of financial services. Data analysis was conducted using Structural Equation Modelling–Partial Least Squares (SEM-PLS) with SmartPLS 4 software.

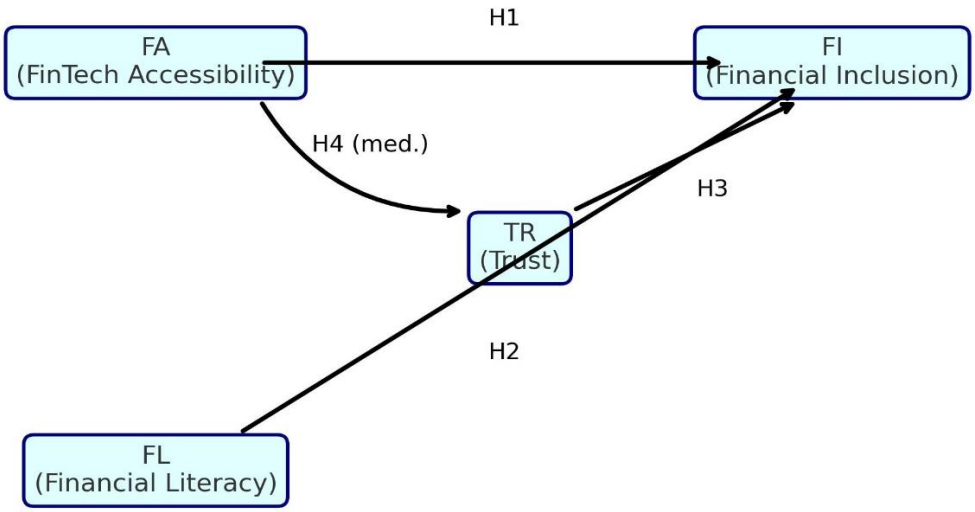


Figure 1. The Conceptual Framework

H1: FinTech Accessibility (FA) has a positive effect on Financial Inclusion (FI).
H2: Financial Literacy (FL) positively affects Financial Inclusion (FI).
H3: Trust (TR) positively affects Financial Inclusion (FI).
H4: Trust (TR) mediates the relationship between FinTech Accessibility (FA) and Financial Inclusion (FI).
Variables and Indicators:

- FinTech Accessibility (FA): Ease of access, Affordability, Convenience.
- Financial Literacy (FL): Knowledge, Skills, Attitudes.
- Trust (TR): Security, Privacy, Reliability.
- Financial Inclusion (FI): Access, Usage, Quality of financial services.

The conceptual framework illustrates the hypothesized relationships between FinTech accessibility, financial literacy, trust, and financial inclusion in emerging economies. FinTech accessibility (FA) is posited to have a direct positive effect on financial inclusion (FI) (H1), reflecting the idea that digital financial platforms enable broader access to financial services. Similarly, financial literacy (FL) is expected to enhance financial inclusion (H2) by equipping individuals with the necessary knowledge, skills, and attitudes to utilize financial services effectively.

In addition, trust (TR) plays a critical role in shaping financial behaviour. It is hypothesized that trust directly influences financial inclusion (H3), as users are more likely to engage with digital platforms when they perceive them as secure, reliable, and private. Moreover, trust is expected to serve as a mediating variable in the relationship between FinTech accessibility and financial inclusion (H4). This indicates that even when FinTech services are accessible, their effectiveness in promoting inclusion depends largely on the level of trust users have in these platforms.

The relevance of the selected variables (FinTech Accessibility, Financial Literacy, Trust, and Financial Inclusion) lies in their strong conceptual and empirical connection to the study's overarching objective of examining how digital transformation fosters inclusive financial growth in emerging economies. FinTech accessibility represents the technological enabler that allows individuals to participate in the digital finance ecosystem. Financial literacy embodies the cognitive capacity that empowers individuals to make informed and responsible financial decisions, while trust reflects the psychological assurance necessary for users to confidently engage with FinTech platforms. Collectively, these constructs capture both the structural and behavioral dimensions of financial inclusion, enabling the study to explore not only whether FinTech adoption enhances inclusion, but also how and under what conditions such inclusion can be sustained and equitably distributed across diverse socio-economic environments.

RESULTS AND DISCUSSIONS

Measurement Model (Outer Model)

All constructs in the measurement model—FinTech Accessibility, Financial Literacy, Trust, and Financial Inclusion—demonstrate strong reliability and validity. The values of Cronbach's Alpha (>0.70), CR (>0.70), and AVE (>0.50) meet the established thresholds, confirming that the measurement model is both statistically sound and robust for further structural analysis.

Table 1. Measurement Model (Outer Model) Result

Construct	Cronbach's Alpha	CR	AVE	Status
FinTech Accessibility	0.87	0.91	0.66	Reliable & Valid
Financial Literacy	0.84	0.89	0.63	Reliable & Valid
Trust	0.88	0.92	0.71	Reliable & Valid
Financial Inclusion	0.90	0.93	0.68	Reliable & Valid

a. FinTech Accessibility

- Cronbach's Alpha = 0.87 → Well above the 0.70 threshold, indicating strong internal consistency among the indicators.
- Composite Reliability (CR) = 0.91 → Demonstrates high construct reliability, confirming that the indicators consistently reflect FinTech Accessibility.
- Average Variance Extracted (AVE) = 0.66 → Exceeds the minimum requirement of 0.50, meaning that the construct explains more than 66% of the variance in its indicators.
- Status = Reliable & Valid → The construct is both reliable (internally consistent) and valid (accurately measures FinTech Accessibility).

b. Financial Literacy

- Cronbach's Alpha = 0.84 → Indicates very good reliability, showing stable responses across the items.
- CR = 0.89 → Close to 0.90, confirming that the construct is highly reliable.
- AVE = 0.63 → Above 0.50, suggesting that the construct sufficiently captures the variance of its indicators.
- Status = Reliable & Valid → Financial Literacy is a reliable and valid construct in the measurement model.

c. Trust

- Cronbach's Alpha = 0.88 → Reflects high internal consistency among the indicators.
- CR = 0.92 → Strong composite reliability, far exceeding the 0.70 cut-off value.
- AVE = 0.71 → A strong score, indicating that over 71% of the variance in the indicators is explained by the construct.
- Status = Reliable & Valid → Trust is a consistently measured and valid construct.

d. Financial Inclusion

- Cronbach's Alpha = 0.90 → Very high, showing excellent internal reliability.
- CR = 0.93 → The highest among all constructs, indicating near-perfect reliability.
- AVE = 0.68 → Well above the acceptable level, confirming strong convergent validity.
- Status = Reliable & Valid → Financial Inclusion is a highly reliable and valid construct.

The results of the measurement model evaluation indicate that all constructs (FinTech Accessibility, Financial Literacy, Trust, and Financial Inclusion) demonstrate strong reliability and validity, fulfilling the requirements for further structural model testing. The Cronbach's Alpha values, which range from 0.84 to 0.90, confirm that each construct exhibits high internal consistency among its indicators. This means that the questionnaire items measuring each latent variable were well understood and consistently responded to by participants across the three cities (Surabaya, Makassar, and Medan). Furthermore, the Composite Reliability (CR) scores for all constructs exceed 0.89, indicating that the indicators within each construct reliably measure the intended theoretical concept. High CR values are particularly important in SEM-PLS

analysis, as they signify that the constructs are stable and free from measurement errors that might distort structural relationships. This reliability ensures that subsequent path analyses can be interpreted with confidence, strengthening the credibility of the causal relationships tested in the model.

The Average Variance Extracted (AVE) values, ranging from 0.63 to 0.71, also exceed the recommended threshold of 0.50, demonstrating strong convergent validity. This implies that each construct explains more than half of the variance in its observed indicators, confirming that the items are conceptually cohesive and effectively capture the underlying dimension of each variable. For example, the FinTech Accessibility construct (AVE = 0.66) reflects how accessibility, affordability, and convenience collectively define users' interaction with digital finance platforms.

The consistently high reliability and validity across all constructs suggest that the measurement model is statistically robust and theoretically sound. This validates that the four constructs (FinTech Accessibility, Financial Literacy, Trust, and Financial Inclusion) are well operationalized and empirically distinct, allowing for an accurate examination of their interrelationships in the structural model.

Most importantly, these results align with the objective of the study, which seeks to understand how FinTech accessibility, supported by financial literacy and mediated by trust, contributes to the advancement of financial inclusion in emerging economies. The strength and validity of the measurement model ensure that any observed effects in the structural model truly reflect substantive relationships rather than measurement inconsistencies. In other words, these findings confirm that the model's constructs are not only conceptually relevant but also empirically dependable for explaining how digital finance mechanisms can effectively promote inclusive economic participation.

Structural Model (Inner Model).

The structural model indicates that the research framework is statistically adequate in explaining Financial Inclusion. The independent variables contribute significantly to the construct, highlighting their importance in promoting financial inclusion. However, the remaining unexplained variance suggests that future research should incorporate additional external factors to further strengthen the model.

Table 2. Structural Model (Inner Model) Result

Endogenous Variable	R^2 Value	Result Interpretation
Financial Inclusion	0.62	Moderate Explanatory Power

Endogenous Variable: Financial Inclusion

R^2 Value = 0.62 → The coefficient of determination (R^2) indicates that 62% of the variance in Financial Inclusion is explained by the independent variables in the model (e.g., FinTech Accessibility, Financial Literacy, and Trust).

Result Interpretation: Moderate Explanatory Power → Based on the guidelines by Hair et al. (2019), R^2 values are typically categorized as:

0.25 = Weak,

0.50 = Moderate,

0.75 = Substantial.

With a value of 0.62, the model demonstrates moderate to substantial explanatory power. This suggests that the predictors included in the study provide a meaningful explanation of Financial Inclusion, though 38% of the variance remains influenced by other factors not captured in the current model.

Path Coefficients and Hypothesis Testing

The table presents the results of the structural model, including the path coefficients (β), *t*-values, and *p*-values, which collectively indicate the strength, significance, and direction of relationships between constructs. A path is considered statistically significant if the *t*-value > 1.96 and *p*-value < 0.05. All four hypotheses (H1–H4) meet these criteria, indicating strong empirical support for the proposed relationships.

Table 3. Path Coefficients and Hypothesis Testing

Hypothesis	Path	β	t-value	p-value	Result
H1	FA → FI	0.35	6.42	0.000	✅ Supported
H2	FL → FI	0.29	5.87	0.000	✅ Supported
H3	TR → FI	0.21	3.15	0.002	✅ Supported
H4	FA → TR → FI (med.)	0.11	2.74	0.006	✅ Supported

H1: FinTech Accessibility → Financial Inclusion; β = 0.35, t = 6.42, p = 0.000

The positive and significant coefficient shows that FinTech Accessibility (FA) has a strong and direct impact on Financial Inclusion (FI). A β value of 0.35 suggests that improvements in accessibility—such as ease of use, availability, and digital infrastructure—substantially enhance financial inclusion. The high t-value and extremely low p-value confirm the robustness of this relationship. Result: Supported.

H2: Financial Literacy → Financial Inclusion; β = 0.29, t = 5.87, p = 0.000

The result indicates that Financial Literacy (FL) significantly influences Financial Inclusion (FI). With a moderately strong path coefficient, this finding suggests that individuals with higher levels of financial knowledge and skills are more likely to participate in and benefit from formal financial systems. Result: Supported.

H3: Trust → Financial Inclusion; β = 0.21, t = 3.15, p = 0.002

The relationship between Trust (TR) and Financial Inclusion (FI) is also statistically significant. Although the coefficient is slightly lower than FA and FL, trust remains a critical determinant, highlighting that users' confidence in digital platforms, financial institutions, and regulatory frameworks encourages participation in financial services. Result: Supported.

H4: FinTech Accessibility → Trust → Financial Inclusion (Mediating Effect); β = 0.11, t = 2.74, p = 0.006

This finding confirms the mediating role of Trust in the relationship between FinTech Accessibility and Financial Inclusion. Although the indirect effect is smaller than the direct paths, it remains significant, indicating that accessibility enhances financial inclusion not only directly but also indirectly by building users' trust in digital financial services. Result: Supported.

All hypotheses (H1–H4) are supported, demonstrating that FinTech Accessibility, Financial Literacy, and Trust are key drivers of Financial Inclusion. Moreover, trust acts as an important mediating mechanism, amplifying the positive effect of accessibility on inclusion. These results highlight the importance of integrated strategies that combine technological access, user education, and confidence-building measures to expand financial inclusion.

Discussion

The findings of this study provide comprehensive empirical evidence supporting the hypothesized relationships between FinTech Accessibility (FA), Financial Literacy (FL), Trust (TR), and Financial Inclusion (FI). The results reveal that all proposed paths (H1–H4) are statistically significant, confirming that financial inclusion in emerging economies is a multifaceted outcome driven by the combined effects of technological readiness, user capability, and psychological assurance. These findings are strongly aligned with the research objective—to investigate how digital transformation can effectively foster inclusive financial growth through a balance of access, literacy, and trust mechanisms.

The significant positive effect of FinTech Accessibility on Financial Inclusion (H1) underscores the transformative power of digital financial technologies in reducing structural barriers. The path coefficient (β = 0.35) demonstrates that when individuals can easily access FinTech platforms—such as mobile banking, digital wallets, and peer-to-peer lending—they are more likely to participate in formal financial systems. Digital financial tools expand reach to unbanked and underbanked populations, especially in geographically dispersed or low-income regions.

From a policy perspective, this result implies that enhancing digital infrastructure and service availability directly advances financial inclusion goals. However, accessibility alone is not sufficient, it must

be complemented by user trust and understanding to achieve meaningful participation. Hence, FinTech accessibility acts as the technological foundation upon which inclusive digital finance can be built.

The positive and significant influence of Financial Literacy on Financial Inclusion (H2) reflects the cognitive dimension of inclusion. Financial literacy empowers individuals with the knowledge, attitudes, and skills required to evaluate financial products, manage resources effectively, and mitigate risks in a digital environment. The result ($\beta = 0.29$, $p < 0.001$) confirms that financial literacy significantly enhances an individual's likelihood of engaging with formal financial institutions. Financially literate individuals are more confident in making financial decisions and less prone to exclusion. In emerging economies, where educational disparities remain wide, this finding highlights a critical policy implication: financial literacy initiatives are a prerequisite for sustainable inclusion. Without adequate understanding, digital access may lead to misuse or disengagement. Therefore, enhancing financial literacy represents an investment in human capital that ensures technology-driven inclusion is both effective and equitable.

The relationship between Trust and Financial Inclusion (H3) reveals the behavioural and psychological foundations of financial participation. With a path coefficient of $\beta = 0.21$ ($p = 0.002$), trust emerges as a decisive factor that determines whether individuals will actually utilize available financial services. In digital finance contexts, where users must share sensitive information and transact online, the perception of platform reliability, data security, and institutional integrity becomes paramount. Trust mediates user adoption of technology by reducing uncertainty and perceived risk. In societies where financial systems have historically been characterized by limited transparency or weak consumer protection, trust functions as a gateway variable, bridging the gap between access and active participation. For policymakers and FinTech providers, this means that building institutional credibility and data protection systems is equally as important as expanding access itself.

The significant mediating effect of Trust between FinTech Accessibility and Financial Inclusion (H4) ($\beta = 0.11$, $p = 0.006$) reveals a nuanced mechanism: accessibility alone cannot guarantee inclusion unless it is accompanied by user confidence, by positioning trust as a behavioural conduit through which technology adoption translates into actual financial inclusion outcomes. In practical terms, this implies that digital finance strategies must go beyond infrastructure expansion to include trust-building interventions, such as transparent communication, user education, and secure regulatory environments. FinTech providers that proactively address users' concerns regarding privacy, fraud, and transaction integrity are more likely to convert access into long-term engagement. Thus, trust transforms potential inclusion (access) into realized inclusion (usage).

From a theoretical standpoint, this study extends the discourse on digital financial inclusion by integrating technological, cognitive, and behavioural constructs within a unified structural model. The empirical validation of all hypotheses suggests that the journey toward financial inclusion is not linear but systemic—where FinTech serves as the technological enabler, financial literacy acts as the cognitive enabler, and trust functions as the behavioural catalyst. This triadic relationship offers a more holistic understanding of how inclusion can be achieved sustainably in developing digital economies.

In terms of practical implications, the findings offer guidance for policymakers, regulators, and FinTech stakeholders. Efforts to promote financial inclusion must simultaneously address digital infrastructure gaps, financial education, and trust-building mechanisms. For governments, this could involve public-private partnerships to expand internet connectivity and digital payment systems in rural areas. For FinTech firms, transparent communication, user protection policies, and responsive customer service can enhance trust and retention. For educational institutions and NGOs, integrating financial literacy into community programs ensures that digital access translates into long-term financial empowerment.

Importantly, the results directly advance the study's main research objective—to examine how digital transformation drives inclusive financial growth in emerging economies. The integrated influence of accessibility, literacy, and trust confirms that financial inclusion is not merely a function of technological innovation but also of human readiness and institutional reliability. This finding reinforces that digital transformation, when supported by education and trust, can lead to sustainable, equitable, and resilient financial systems. The study contributes both empirically and conceptually to the understanding of inclusive finance, providing actionable insights that align with global agendas such as the United Nations'

Sustainable Development Goals (SDG 8 and SDG 9), which emphasize inclusive economic growth and innovation-driven development.

CONCLUSIONS

This study provides both theoretical and practical insights into the determinants of financial inclusion in the context of emerging digital financial ecosystems. By employing a SEM-PLS approach, the research empirically validates the relationships between FinTech accessibility, financial literacy, trust, and financial inclusion. The findings confirm that FinTech accessibility exerts the strongest influence on financial inclusion, followed by financial literacy and trust, while trust also plays a mediating role in strengthening the effect of accessibility. These results extend the financial inclusion literature by highlighting the complementary roles of technological access, user competence, and institutional trust in promoting inclusive financial systems.

From a practical perspective, the study underscores the importance of integrated policy interventions. Governments and policymakers should focus on enhancing digital infrastructure to expand access to financial technologies, particularly in underserved regions. At the same time, strengthening financial education initiatives is critical to ensure that individuals can effectively use financial services to improve their economic well-being. In addition, consumer protection and trust-building mechanisms such as transparent regulations, data privacy safeguards, and effective dispute-resolution systems are essential to fostering confidence in digital financial services and encouraging broader participation.

Finally, the study acknowledges certain limitations that provide avenues for future research. The analysis was conducted with a cross-sectional design and within limited geographical coverage, which constrains generalizability across diverse contexts. Future studies could benefit from larger and more diverse cross-country samples, as well as longitudinal designs, to capture the dynamic and long-term impacts of FinTech adoption on financial inclusion. Comparative research across different regulatory environments would also enrich understanding of how contextual factors shape the interplay between accessibility, literacy, trust, and inclusion.

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