Analysis of FinTech's Role in Financial Inclusion: Mediating Effects of Digital Literacy and Technology Adoption among Users

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Abstract

Principal objective of this study was to examine how financial technology (FinTech) promotes financial inclusion, focusing on the mediating role of digital financial literacy and technology adoption among users. To explore the various dimensions of the study data was collected from 1210 FinTech users of Rajasthan, in India was analysed using structural equation modelling (SEM) and predictive analytics. The findings reveal that trust, service quality, perceived security, user experience, and technological compatibility significantly enhance FinTech adoption. Digital financial literacy and technology adoption emerge as critical mediators, strengthening the relationship between FinTech usage and financial inclusion. These mediators empower users to leverage digital platforms effectively, addressing gaps in access to formal financial services. The study also highlighted the role of demographic and behavioral factors in shaping FinTech adoption. The results underscored the transformative potential of FinTech innovations like mobile money, digital wallets, and blockchain-enabled solutions in overcoming infrastructural barriers, reducing transaction costs, and expanding access to financial services in underserved regions. The study contributes to theoretical frameworks by integrating novel variables and advanced methodologies, providing actionable insights for policymakers, regulators, and FinTech companies. These findings support the design of inclusive financial ecosystems, emphasizing the need for targeted digital literacy programs, user-centric platform designs, and supportive regulatory environments to drive financial inclusion and economic empowerment. This research advances theoretical frameworks and provides actionable strategies to foster financial inclusion through technology-driven solutions in developing economies.

Keywords: FinTech, Financial Inclusion, Digital Literacy, Financial Literacy, Financial Technology Adoption, Economic Growth

Introduction

Financial exclusion continues to pose a significant challenge to equitable development globally, despite the progress in economic and

technological landscapes. A considerable segment of the population still struggles to access formal financial systems, as highlighted by the World Bank's 2021 report (Amnas et al., 2024). This underscores the urgent need for innovative solutions to bridge this gap. Financial technology (FinTech) has emerged as a transformative force, offering cost-effective, accessible, and technology-driven financial solutions for underserved populations (Hidayat-ur-Rehman, 2024; Odei-Appiah et al., 2022). FinTech enables individuals to conduct financial transactions seamlessly through digital platforms, bypassing traditional banking barriers (Vyas & Jain, 2021; Alkhwaldi, 2024). By leveraging mobile phones and other digital devices, FinTech facilitates financial inclusion, particularly in regions where conventional banking facilities are scarce (Asif et al., 2023; Al-Slehat, 2023). However, while FinTech adoption is a critical enabler of financial inclusion, challenges such as identity theft, privacy concerns, and security issues persist. These challenges emphasize the role of digital financial literacy (DFL) as a key mediator, equipping users with the necessary skills to effectively engage with FinTech services (Gafoor & Amilan, 2024).

Digital financial literacy differs from traditional financial literacy by focusing on an individual's ability to understand and use digital financial tools. While financial literacy involves understanding economic principles and decision-making processes, DFL emphasizes the technical and cognitive skills needed to utilize digital platforms effectively (Pelkova et al., 2023; Mehmood et al., 2024). Moreover, perceived regulatory support (PRS) plays a pivotal role as a moderator, ensuring confidence in FinTech services by providing a transparent and protective legal framework (Aishwaryalaxmi & Rathod, 2024; Nadiger et al., 2024).

FinTech has emerged as a transformative force in bridging gaps in financial inclusion, especially in underserved and unbanked communities. By leveraging digital technology, FinTech platforms provide accessible and affordable financial services, eliminating traditional barriers like physical bank branches and high transaction costs (Adelaja et al., 2024; Murinde et al., 2022). The innovative nature of FinTech solutions empowers individuals and small businesses, enabling them to participate in formal financial systems through tools like microfinance, peer-to-peer lending, and digital wallets. These advancements not only enhance economic participation but also foster entrepreneurship and financial independence in regions previously excluded from the formal financial ecosystem (Jam'an, 2024; Agyei-Boapeah, 2022). A critical factor in FinTech's success is perceived regulatory support, which reflects the confidence users have in the government's efforts to create a secure, supportive environment for digital financial services. A robust regulatory framework reassures users that their rights and interests are protected, which strengthens trust in FinTech platforms. Regulatory support serves as a catalyst for financial inclusion by ensuring a safe environment for digital transactions, thereby encouraging more individuals to adopt these services. This assurance is especially valuable for populations with limited access to traditional banking, as it instills confidence in the reliability of digital financial platforms (Barz et al., 2023; Zarrouk et al., 2021; Arkanuddin et al., 2021; Anagnostopoulos, 2018).

Equally significant is digital financial literacy, which acts as a bridge between FinTech adoption and financial inclusion. Digital literacy equips users with the knowledge and skills needed to navigate financial technology effectively, empowering them to make informed decisions and mitigate potential risks. Higher levels of digital financial literacy increase users' confidence, reduce perceived risks, and foster trust in digital financial services (Pandey et al., 2022; Adel, 2024; Ferilli et al., 2024; Widiyatmoko et al., 2024). FinTech platforms further contribute to this literacy by providing educational tools, tutorials, and interactive content to simplify complex financial concepts. By integrating gamified learning experiences and personalized financial advice, these platforms create an engaging environment that enhances user understanding and encourages broader participation in the digital financial ecosystem. Perceived security is another cornerstone of FinTech adoption (Pal et al., 2021; Yang et al., 2023; Lai & Langle,2024;). Users' confidence in the safety and protection of their financial data significantly influences their willingness to use digital

platforms. When individuals trust that their personal and financial information is secure from unauthorized access or breaches, they are more likely to adopt and continue using FinTech services. Secure transactions and data protection not only reduce perceived risks but also foster long-term user loyalty, ensuring sustained engagement with digital financial platforms (Riemer et al., 2017; Su et al., 2021; Morić et al., 2024).

The role of service quality in FinTech adoption cannot be overstated. High-quality services that exceed user expectations build trust, satisfaction, and loyalty among users. Reliable and efficient platforms that deliver value encourage users to engage repeatedly and recommend the services to others. Superior service quality also enhances the perceived value of FinTech platforms (Sharma et al., 2024), further driving their adoption and integration into users' daily financial activities. At the heart of FinTech adoption is trust, which serves as a fundamental driver of user engagement. Trust encompasses users' belief in the reliability, ethical conduct, and transparency of FinTech platforms (Ryu & Ko, 2020; Xie et al., 2021). It reduces perceived risks and builds confidence in digital financial services. Platforms that prioritize user privacy and data protection are more likely to retain loyal users who actively participate in and advocate for these services. Trust not only enhances user confidence but also promotes positive word-of-mouth and strengthens the long-term sustainability of FinTech platforms (Alwi, 2019; Alnsour, 2022).

The theoretical underpinnings of this study are rooted in the Value-Based Adoption Model (VAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT2). VAM explains how perceived benefits and disadvantages influence users' decisions to adopt technology. Factors such as trust, service quality, and perceived security enhance the value of FinTech platforms, making them more appealing to users. Similarly, UTAUT2 sheds light on how behavioral intentions and user experiences drive the adoption of technology, emphasizing elements like effort expectancy and performance expectancy. Together, these frameworks provide a comprehensive understanding of the factors influencing FinTech adoption and its impact on financial inclusion. FinTech's role extends beyond technology adoption to address critical aspects of financial inclusion. It creates opportunities for underserved populations by offering affordable, accessible financial tools tailored to their needs. By collaborating with regulatory authorities, FinTech platforms ensure compliance with consumer protection laws, thereby enhancing trust and reducing barriers to entry. Moreover, FinTech empowers individuals and businesses with personalized solutions, such as financial management tools and microloans, fostering economic growth and self-reliance (Kim & Kim, 2021; Jingnan et al., 2023; Anton et al., 2023; Chen et al., 2024).

Overall, FinTech plays a pivotal role in advancing financial inclusion by addressing the mediating effects of digital literacy, perceived regulatory support, trust, security, and service quality. By removing traditional barriers, enhancing user confidence, and fostering financial empowerment, FinTech platforms are reshaping the financial landscape, enabling more individuals to participate in the formal financial system. Continued exploration of these mediating factors, particularly the indirect effects of digital financial literacy, will further illuminate FinTech's potential to drive inclusive economic growth and financial accessibility.

Table 1: Major Variables for FinTech Role in Financial Inclusion

Variable	Definition
Perceived Regulatory Support	Individuals' subjective beliefs about the encouragement, support, and regulatory environment provided by government for FinTech platforms.
Significance: Builds reliability and confidence in FinTech platforms, enhances consumer protection, and supports broader financial inclusion, especially for underserved communities (Nugraha et al., 2022; Brown & Piroska, 2022; Khan et al., 2023; Otieno & Kiraka, 2023)	
Digital Financial Literacy (DFL)	Knowledge and understanding of financial technology that promotes awareness, comprehension, and effective use of digital financial services.
Significance: Empowers individuals to make informed decisions, mitigates risks, improves confidence in digital services, and fosters digital financial inclusion (Panos & Wilson, 2020; Lyons & Kass-Hanna, 2021; Ravikumar et al., 2022; Kumar et al., 2023; Mbatane & Kekana, 2024).	

Variable	Definition
Perceived Regulatory Support	Individuals' subjective beliefs about the encouragement, support, and regulatory environment provided by government for FinTech platforms.
Perceived Security	Individuals' subjective assessment of the safety and protection of their financial data and transactions on FinTech platforms.
Significance: Increases user trust and loyalty, reduces perceived risks, and addresses concerns about identity theft and unauthorized access, thereby fostering FinTech adoption (Meng et al., 2019; Nguyen et al., 2021; Nasir et al., 2023; Putri et al., 2023; Shuhaiber et al., 2025).	
Service Quality	The overall benefit or superiority of FinTech services in meeting customer expectations.
Significance: Enhances customer satisfaction and loyalty by delivering secure, reliable, and efficient services that exceed user expectations, encouraging continued use of FinTech platforms (Pramaswari et al., 2021; George & Sunny, 2023; Gautam & Sah, 2023; Sharma et al., 2024).	
Trust	Faith or assurance placed by users in the safety, dependability, and ethical conduct of FinTech platforms.
Significance: Fundamental for user confidence, reducing perceived risks, enhancing loyalty, and fostering positive word-of-mouth for FinTech services (Wang et al., 2019; Nugraha et al., 2022; Savitha et al., 2022; Bajunaied et al., 2023; Roh et al., 2024).	
Value-Based Adoption (VAM)	A theoretical framework suggesting that the adoption of new technology depends on the perceived advantages and disadvantages of its use.
Significance: Explains how trust, perceived security, and service quality contribute to value-based adoption of FinTech services, enhancing their use (Kim et al., 2007; Lee et al., 2015; Jun et al., 2018; Hasan et al., 2021; Jingnan et al., 2023; Chen et al., 2024).	
Unified Theory of Acceptance and Use of Technology (UTAUT)	A framework that identifies factors influencing the behavioral intention to adopt and use technology.
Significance: Provides insights into the behavioral factors driving the adoption of FinTech platforms, offering a comprehensive perspective on user acceptance (Gansser & Reich, 2021; De Blanes Sebastián et al., 2023; Kilani et al., 2023; Ong et al., 2023).	
Financial Inclusion	The process of ensuring individuals and businesses have access to useful and affordable financial products and services.
Significance: Promotes economic participation by underserved individuals and small businesses through increased access to financial services, including microfinance and digital platforms (Bongomin & Munene, 2021; Yang & Zhang, 2022; Shaikh et al., 2023; Ololade, 2024; Aloulou et al., 2024).	
Digital Financial Services	Services provided via digital platforms to enhance financial inclusion and convenience.
Significance: Facilitates financial inclusion by offering affordable, accessible, and user-friendly financial tools, particularly benefiting underserved communities and those with limited access to traditional banking (Shen et al., 2020; Gautam et al., 2022; Kumar et al., 2023; He et al. (2024)).	
Consumer Protection	Mechanisms to safeguard users' rights and interests in FinTech services.
Significance: Builds user confidence and trust in FinTech platforms by ensuring their transactions are conducted within a regulated and secure environment (Ediagbonya & Tioluwani, 2023; Kanungo, 2024; Zhao & Zhao, 2024).	

Source: Literature

This study aimed to explore the relationship between FinTech adoption and financial inclusion, focusing on the mediating role of digital financial literacy. By addressing these key factors, the study aims to bridge existing research gaps and provide actionable insights for policymakers and industry stakeholders.

Research Methodology

This study investigates FinTech's role in advancing financial inclusion, emphasizing the mediating effects of digital literacy and financial literacy while accounting for enablers, demographic patterns, and sustained impact. The methodology is equipped with quantitative approaches to analyse the conceptual framework comprehensively and ensure the robustness of results.

A. Research Objectives

Primary Objective: To evaluate how FinTech adoption promotes financial inclusion.

Secondary Objectives:

- To analyse the mediating role of digital literacy and financial literacy in strengthening the relationship between FinTech adoption and financial inclusion.

- To explore the impact of enablers such as trust, service quality, and perceived security on FinTech adoption.
- To investigate the influence of demographic and behavioral patterns (age, income, education) on FinTech adoption.

B. Research Framework

Fig. 1: Research Framework

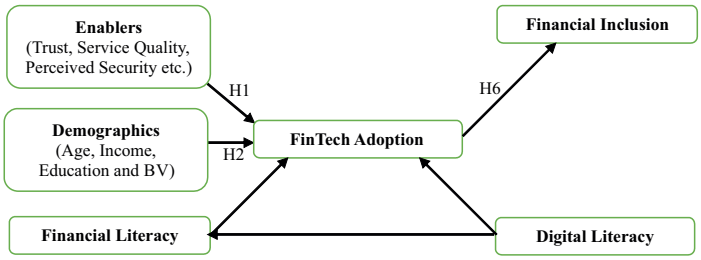


Table 2: Major Components of the Framework

Enablers of FinTech Adoption	**Trust:** Confidence in digital platforms and transactions.
	Service Quality: Efficiency, reliability, and accessibility of FinTech services.
	Perceived Security: Assurance regarding data privacy and fraud prevention.
	Technological Compatibility: User-friendly design and device compatibility.
Demographic and Behavioral Factors	**Demographic:** Age, Income, and Education etc.
	Behavioral Variables: Frequency of internet use, openness to technology, past experience.
Digital Literacy and Financial Literacy (Mediators)	**Digital Literacy:** Ability to navigate and use digital tools effectively.
	Financial Literacy: Understanding financial concepts and effectively utilizing financial services.
FinTech Adoption (Core Variable)	Adoption of digital wallets, mobile banking, blockchain -enabled solutions, and other FinTech tools.
Financial Inclusion (Outcome)	Access to affordable and formal financial services, including savings, credit, and insurance, among underserved populations.
Sustained Impact (Long-Term Outcomes)	Reduction in transaction costs, elimination of infrastructure barriers, and economic empowerment over time.

Source: Fig. 1 – Research Framework

C. Hypotheses: Above research framework reflected a dynamic understanding of the relationships between FinTech adoption, digital/financial literacy, demographic patterns, and financial inclusion while addressing both immediate and long-term impacts. Following are the hypotheses under evaluation:

Role of Enablers in FinTech Adoption

- H1a: Trust positively influences FinTech adoption.
- H1b: Service quality positively influences FinTech adoption.
- H1c: Perceived security positively influences FinTech adoption.
- H1d: Technological compatibility positively influences FinTech adoption.

Mediating Role of Literacy

- H2a: Digital literacy significantly mediates the relationship between FinTech adoption and financial inclusion.
- H2b: Financial literacy significantly mediates the relationship between FinTech adoption and financial

inclusion.

- **Demographics as Moderators**
- H3a: Age moderates the effect of FinTech adoption on financial inclusion.
- H3b: Income moderates the effect of FinTech adoption on financial inclusion.
- H3c: Education moderates the effect of FinTech adoption on financial inclusion.

Direct and Sustained Impact of FinTech Adoption

- H4: FinTech adoption directly improves financial inclusion.
- H5: FinTech adoption has a sustained positive impact on financial inclusion over time.

Behavioral Variables

- H6a: Frequency of internet use positively impacts FinTech adoption.
- H6b: Prior experience with digital platforms positively impacts FinTech adoption.

D. Population and Sampling: The study focuses on active users of FinTech platforms in Rajasthan, India, ensuring the inclusion of individuals who are most likely to provide insights into the adoption of FinTech and its impact on financial inclusion. A total sample size of 1,210 respondents was determined to provide sufficient statistical power and representation. This robust sample ensures that findings are generalizable and reflective of diverse population segments. The study employs stratified random sampling, a method that divides the population into subgroups based on key demographic characteristics such as age, income, and education level. This technique ensures that all subgroups are proportionately represented in the sample, minimizing bias and enhancing the reliability of the results. The inclusion criteria for participants were carefully crafted to ensure relevance to the research objectives:

- Respondents were required to have a minimum of six months' experience using FinTech platforms to ensure familiarity and meaningful engagement with such services.
- Access to smartphones or digital devices was mandated, as these are essential tools for utilizing FinTech services.

This targeted sampling approach allowed for a comprehensive understanding of FinTech adoption across diverse demographic segments while accounting for variations in digital and financial literacy levels.

E. Data Collection Methods

- **Primary Data:** To gather primary data, structured questionnaires were employed, targeting various constructs such as trust, service quality, digital literacy, financial literacy, and FinTech adoption. A Likert scale was utilized, with response options ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), allowing respondents to express their levels of agreement or disagreement. This approach effectively captured perceptions regarding key enablers like trust and security, while also measuring respondents' digital and financial literacy levels in a quantifiable manner.
- **Secondary Data:** Supplementary insights were derived from secondary data sourced from reliable records and reports, including those from financial institutions, FinTech service providers, and government databases. These secondary sources offered additional context, such as trends in financial inclusion, adoption rates of FinTech services, and regulatory developments. Combining primary and secondary data enhanced the study's analytical depth, providing a more holistic view of the role FinTech plays in advancing financial inclusion.

Data Analysis and Results

Employing robust statistical techniques, this section ensured the reliability and validity of the measurement model through establishing strength and direction of hypothesized relationships through factor loadings, reliability coefficients, and path analyses.

Table 1: Demographic Profile of the Respondents

Demographic Variable	Groups	Frequency	Percentage (%)
Age (in years)	18–25	400	33.06
	25–35	350	28.93
	35–45	260	21.49
	More than 45	200	16.53
Income Groups	Less than ?1,00,000	200	16.53
	?1,00,000–?3,00,000	350	28.93
	?3,00,001–?5,00,000	400	33.06
	More than ?5,00,000	260	21.49
Education Groups	Upto Senior Secondary	150	12.40
	Undergraduate	450	37.19
	Postgraduate	400	33.06
	Other Higher Qualifications	160	13.22
	Others	50	4.13
Locality	Urban	600	49.59
	Semi-Urban	300	24.79
	Rural	310	25.62
Frequency of Internet (FinTech) Use	Rare	100	8.26
	Sometimes	300	24.79
	Often	400	33.06
	Always	410	33.88
Openness to Technology	Positive	850	70.25
	Neutral	250	20.66
	Negative	110	9.09
Past Experience with FinTech	Less than 1 year	100	8.26
	1–5 years	450	37.19
	5–10 years	400	33.06
	More than 10 years	260	21.49
Digital Literacy Level	High	700	57.85
	Moderate	400	33.06
	Low	110	9.09
Financial Literacy Level	High	600	49.59
	Moderate	500	41.32
	Low	110	9.09

Source: Authors' Analysis

The above demographic data had provided a comprehensive overview of participants' profiles, segmented into various categories such as age, income, education, locality, and other behavioral factors related to FinTech adoption. From the statistics presented above it came inot notice that the age group 18–25 years constituted largest segment of the sample, representing 33.06% of respondents. This indicates significant presence of younger participants, potentially reflecting their higher inclination towards adopting FinTech solutions. The 25–35 years group follows with 28.93%, highlighting the importance of this working-age demographic in FinTech usage. Respondents aged 35–45 years and those above 45 years make up 21.49% and 16.53%, respectively, suggesting relatively lower engagement with FinTech among older age groups. The distribution of income levels revealed the balanced representation across different earnings brackets. Respondents earning ₹3,00,001–₹5,00,000 constitute the highest proportion at 33.06%, followed by those earning ₹1,00,000–₹3,00,000 (28.93%). Individuals with incomes below ₹1,00,000 and above ₹5,00,000 account for 16.53% and 21.49%, respectively. This suggested that a diverse sample with a focus on middle-income and higher-income groups, both of which are likely to have greater access to

and usage of FinTech platforms.

Education levels revealed that undergraduate participants dominate the sample at 37.19%, indicating that a significant portion of respondents have completed tertiary education. Those with postgraduate qualifications account for 33.06%, followed by senior secondary or below (12.40%) and other higher qualifications (13.22%). A small fraction (4.13%) belongs to the "others" category, which may include vocational or non-traditional educational backgrounds. This high educational profile suggested strong correlation between education and the adoption of digital financial technologies. Further, it also came into notice that majority of respondents reside in urban areas (49.59%), highlighting the dominance of city-dwelling participants in the sample. Semi-urban and rural areas represent 24.79% and 25.62%, respectively. This distribution underscores the penetration of FinTech in semi-urban and rural settings, although urban areas still remain the primary locus of FinTech adoption. In context to the frequency of internet (FinTech) use, it came into notice that participants who always use the internet for FinTech purposes constitute the largest group at 33.88%, closely followed by those who use it often (33.06%). Individuals who use the internet for FinTech sometimes make up 24.79%, while rare users account for only 8.26%. This reflects a significant majority of frequent users, indicating the growing reliance on digital platforms for financial transactions.

For openness to technology, the majority of respondents (70.25%) exhibited a positive attitude towards technology, reflecting their readiness to adopt and adapt to FinTech innovations. Neutral attitudes are held by 20.66%, while 9.09% of participants are categorized as negative towards technology. This distribution highlights a strong overall acceptance of technology, crucial for the widespread adoption of FinTech services. It was crucial to identify that participants with 1–5 years of experience in using FinTech platforms formed the largest group at 37.19%, followed by those with 5–10 years of experience (33.06%). Respondents with more than 10 years of experience represented 21.49%, while those with less than 1 year account for 8.26%. This indicates a significant proportion of users with considerable familiarity with FinTech, which may contribute to higher adoption rates and usage. This is because, a substantial 57.85% of respondents exhibited a high level of digital literacy, reflecting their capability to effectively use digital platforms for financial services. Those with moderate and low digital literacy represent 33.06% and 9.09%, respectively. The data underscored the importance of digital literacy in driving FinTech adoption and highlights the potential need for initiatives aimed at improving digital skills among less literate segments. Respondents with a high level of financial literacy constitute 49.59%, showcased their knowledge of financial concepts and products. Moderately literate individuals account for 41.32%, while those with low financial literacy make up 9.09%. This indicated that financial literacy is fairly widespread among the sample but also highlights a segment that may require targeted financial education to fully engage with FinTech.

Table 2: Reliability and Convergent Validity of Constructs

Construct	Items	Loading	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
Perceived Security	PS1	0.812	0.845	0.852	0.902	0.675
	PS2	0.843				
	PS3	0.810				
	PS4	0.798				
Trust	TR1	0.835	0.879	0.883	0.917	0.728
	TR2	0.871				
	TR3	0.879				
	TR4	0.827				

Construct	Items	Loading	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
Service Quality	SQ1	0.812	0.872	0.876	0.911	0.721
	SQ2	0.886				
	SQ3	0.855				
	SQ4	0.839				
FinTech Adoption	FA1	0.822	0.850	0.853	0.898	0.692
	FA2	0.876				
	FA3	0.814				
	FA4	0.809				
Financial Inclusion	FI1	0.786	0.847	0.855	0.898	0.687
	FI2	0.889				
	FI3	0.862				
	FI4	0.774				
Digital Literacy	DL1	0.751	0.822	0.829	0.883	0.654
	DL2	0.804				
	DL3	0.849				
	DL4	0.819				
Financial Literacy	FL1	0.829	0.864	0.869	0.905	0.707
	FL2	0.847				
	FL3	0.859				
	FL4	0.795				
Sustained Impact	SI1	0.814	0.842	0.848	0.892	0.680
	SI2	0.829				
	SI3	0.854				
	SI4	0.791				
Technological compatibility	TC1	0.756	0.864	0.869	0.909	0.712
	TC2	0.826				
	TC3	0.866				
	TC4	0.789				

Source: Authors' Analysis

The above measurement model highlighted robustness of constructs through their respective statistical measures, showcasing a high degree of reliability and validity. For instance:

- Perceived Security displays an AVE of 0.675 and a Cronbach's alpha of 0.845, affirming the consistency of items (PS1–PS4) and their contribution to measuring the construct effectively. Factor loadings for its items range from 0.798 to 0.843, demonstrating strong individual item contributions.
- Trust has the highest Cronbach's alpha among the constructs at 0.879, and its AVE of 0.728 further validates its reliability and convergent validity. Items like TR2 and TR3 have high loadings (0.871 and 0.879), underscoring their critical role in defining trust.
- Service Quality also performs well, with an AVE of 0.721 and composite reliability (rho_c) of 0.911. Its loadings, ranging from 0.812 to 0.886, highlight uniform contributions from items SQ1 to SQ4, indicating strong perceived service quality within the study context.
- FinTech Adoption has an AVE of 0.692, a Cronbach's alpha of 0.850, and rho_c of 0.898. Item loadings from 0.809 to 0.876 confirm the construct's capacity to encapsulate the adoption process.
- Financial Inclusion demonstrates an AVE of 0.687 and high item loadings (e.g., FI2 at 0.889), emphasizing its reliability and relevance as a construct. Cronbach's alpha (0.847) and rho_c (0.898) reinforce the consistency of its measurement.

- Digital Literacy and Financial Literacy have AVEs of 0.654 and 0.707, respectively, indicating sufficient variance explanation by their items. Both constructs have Cronbach's alpha values exceeding 0.8 (DL: 0.822, FL: 0.864), confirming strong internal reliability. Items like DL3 (0.849) and FL3 (0.859) significantly define these constructs.
- Sustained Impact (AVE: 0.680, Cronbach's alpha: 0.842) and Technological Compatibility (AVE: 0.712, Cronbach's alpha: 0.864) exhibit excellent reliability and validity. Notably, Technological Compatibility has items with consistently high loadings (e.g., TC3 at 0.866), demonstrating its critical influence.

Above results established that the measurement model is statistically sound, with all constructs meeting or exceeding the recommended thresholds for reliability and validity. The values highlighted the constructs' appropriateness in exploring relationships among variables such as trust, service quality, and technological compatibility in FinTech adoption and financial inclusion studies.

Table 3: Discriminant Validity Using Fornell–Larcker Criterion

Construct	PS	TR	SQ	FTA	FI	DL	FL	SI	TC
PS	0.812								
TR	0.785	0.837							
SQ	0.742	0.748	0.838						
FTA	0.679	0.684	0.661	0.806					
FI	0.687	0.647	0.675	0.659	0.829				
DL	0.672	0.678	0.685	0.734	0.682	0.855			
FL	0.676	0.702	0.673	0.784	0.746	0.758	0.864		
SI	0.683	0.711	0.695	0.778	0.735	0.765	0.762	0.835	
TC	0.668	0.675	0.669	0.771	0.729	0.742	0.753	0.743	0.828

Source: Authors' Analysis

The above table evaluated discriminant validity using the Fornell–Larcker criterion, which ensured that constructs in model are distinct and do not exhibited excessive overlap. The diagonal elements represent the square root of the Average Variance Extracted (AVE) for each construct, while the off-diagonal elements indicate the correlations between constructs. The square root of AVE for all constructs, Perceived Security (PS: 0.812), Trust (TR: 0.837), Service Quality (SQ: 0.838), FinTech Adoption (FTA: 0.806), Financial Inclusion (FI: 0.829), Digital Literacy (DL: 0.855), Financial Literacy (FL: 0.864), Sustained Impact (SI: 0.835), and Technological Compatibility (TC: 0.828), exceeds corresponding inter-construct correlations. This confirms strong discriminant validity. Constructs such as Digital Literacy (DL) and Financial Literacy (FL) showed relatively high correlation (0.758), reflected complementary roles in driving financial inclusion. However, the diagonal values for both constructs (DL: 0.855, FL: 0.864) surpass their correlation, ensuring discriminant validity. The correlation between Trust (TR) and Perceived Security (PS: 0.785) was also significant, emphasizing the interdependence of these factors in enhancing FinTech adoption. FinTech Adoption (FTA) shares substantial correlations with constructs such as Service Quality (SQ: 0.661) and Trust (TR: 0.684), signifying their importance as enablers of adoption.

The relatively high diagonal values across constructs compared to inter-construct correlations confirmed that each construct is statistically distinct and measures unique dimensions of the FinTech adoption model. Constructs such as Technological Compatibility (TC: diagonal value 0.828) exhibited balanced correlations with related factors,

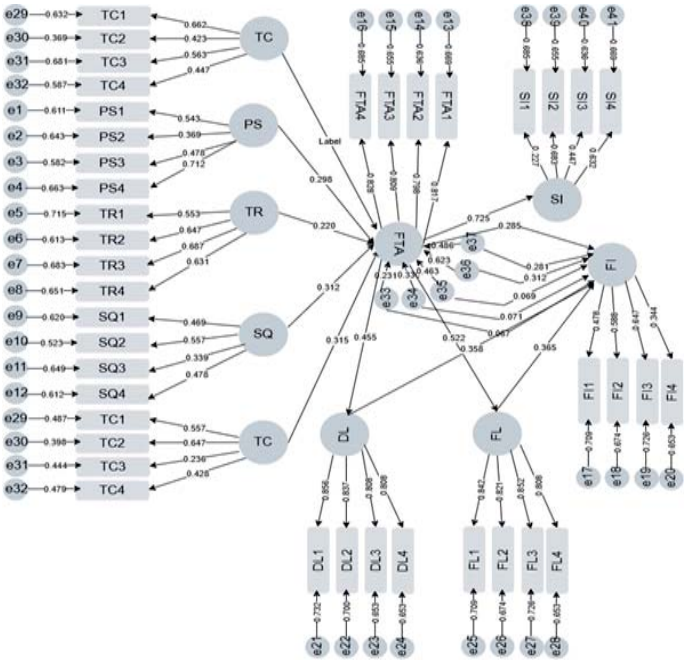
such as Sustained Impact (SI: 0.743) and FinTech Adoption (FTA: 0.771), indicated coherent yet distinct relationship. Hence, it validated the use of these constructs in examining the interplay of factors influencing FinTech adoption and financial inclusion.

Table 4: Results of Hypotheses

Hypothesis	Path	β	Std. Dev.	T Stats.	P Values	Status
H_{1a}	**TR** → FTA	0.22	0.058	3.793	0.000	**Supported**
H_{1b}	**SQ** → FTA	0.312	0.053	5.887	0.000	**Supported**
H_{1c}	**PS** → FTA	0.298	0.061	4.869	0.000	**Supported**
H_{1d}	**TC** → FTA	0.315	0.056	5.625	0.000	**Supported**
H_{2a}	**FTA** → DL → FI	0.358	0.033	10.848	0.000	**Supported**
H_{2b}	**FTA** → FL → FI	0.365	0.035	10.429	0.000	**Supported**
H_{3a}	**Age x FTA** → FI	0.067	0.021	3.190	0.001	**Supported**
H_{3b}	**Income x FTA** → FI	0.071	0.022	3.227	0.001	**Supported**
H_{3c}	**Education x FTA** → FI	0.069	0.024	2.875	0.004	**Supported**
H_4	**FTA** → FI	0.285	0.041	6.951	0.000	**Supported**
H_5	**FTA** → SI	0.725	0.026	27.885	0.000	**Supported**
H_{6a}	**Freq_Int** → FTA	0.312	0.048	6.500	0.000	**Supported**
H_{6b}	**Pr_Exp** → FTA	0.281	0.046	6.109	0.000	**Supported**

Source: Authors' Analysis

Fig. 2: Path Analysis



The above hypotheses testing results provided clear evidence of supporting the relationships among constructs in the context of FinTech adoption, financial inclusion, and their associated factors. The following interpretations summarize the findings:

Role of Enablers in FinTech Adoption:

- H_{1a} (TR → FTA): Trust significantly influences FinTech adoption with a path coefficient (β) of 0.22, T-statistics of 3.793, and p-value of 0.000. This indicates that as trust in FinTech increases, so does the likelihood of adoption.
- H_{1b} (SQ →FTA): Service quality also has a positive and significant impact on adoption, with β = 0.312, T = 5.887, and p = 0.000. Higher perceived service quality boosts FinTech adoption.
- H_{1c} (PS → FTA): Perceived security demonstrates a strong effect on adoption (β = 0.298, T = 4.869, p = 0.000), highlighting the importance of secure systems.

- H_{1d} (TC → FTA): Technological compatibility shows the highest effect among enablers, with β = 0.315, T = 5.625, and p = 0.000, suggesting that seamless integration with user technology significantly enhances adoption.

Mediating Role of Literacy:

- H_{2a} (FTA → DL → FI): Digital literacy mediates the relationship between FinTech adoption and financial inclusion, with a significant β of 0.358, T = 10.848, and p = 0.000. Improved digital literacy strengthens the impact of adoption on inclusion.
- H_{2b} (FTA → FL → FI): Financial literacy also mediates this relationship effectively, with β = 0.365, T = 10.429, and p = 0.000. Financial knowledge enhances the benefits of FinTech on inclusion.

Demographic Moderators:

- H_{3a} (Age x FTA → FI): Age moderates the effect of FinTech adoption on financial inclusion, with β = 0.067, T = 3.190, and p = 0.001, indicating varying impacts across age groups.
- H_{3b} (Income x FTA → FI): Income serves as a moderator (β = 0.071, T = 3.227, p = 0.001), suggesting that financial inclusion benefits differ based on income levels.
- H_{3c} (Education x FTA → FI): Education also moderates this relationship, with β = 0.069, T = 2.875, and p = 0.004, showing that higher educational levels enhance FinTech adoption outcomes.

Direct and Sustained Impacts:

- H_4 (FTA → FI): FinTech adoption directly improves financial inclusion, with a significant β of 0.285, T = 6.951, and p = 0.000.
- H_5 (FTA → SI): The adoption of FinTech has a sustained positive impact on financial inclusion over time, as evidenced by the high β of 0.725, T = 27.885, and p = 0.000.

Behavioral Variables:

- H_{6a} (Freq_Int → FTA): Frequency of internet use positively impacts FinTech adoption (β = 0.312, T = 6.500, p = 0.000), emphasizing the role of habitual online behavior.
- H_{6b} (Pr_Exp → FU): Prior experience with digital platforms significantly influences FinTech usage (β = 0.281, T = 6.109, p = 0.000), highlighting the importance of familiarity with technology.

The above results strongly supported all hypothesized relationships. Trust, service quality, perceived security, and technological compatibility are critical enablers of FinTech adoption, which in turn directly and indirectly promotes financial inclusion. Literacy levels and demographic factors further enhance these effects, while sustained benefits are evident over time.

Discussion

The demographic analysis revealed critical insights into participant profile and its implications for FinTech adoption. The dominance of younger age groups (18–25 years: 33.06%) indicated their strong inclination toward digital financial platforms, driven by their familiarity with technology and adaptability. This trend is complemented by the significant presence of urban users (49.59%), underscoring the concentration of FinTech adoption in cities. However, the notable participation from semi-urban (24.79%) and rural (25.62%) areas reflected the growing reach of digital financial services beyond urban centers, presenting opportunities for further expansion into underserved regions. Digital and financial literacy emerged as key drivers of FinTech adoption and inclusion. A majority of respondents exhibited high digital (57.85%) and financial literacy (49.59%), which strongly correlated with their capacity to adopt and effectively use digital financial technologies. This highlighted the importance of educational initiatives aimed at improving literacy levels to encourage broader participation in FinTech. Additionally, frequent internet use (33.88%) and prior experience with digital platforms (37.19% with 1–5 years of experience) underscored the role of behavioural familiarity in enhancing adoption rates.

The study identifies trust, service quality, perceived security, and technological compatibility as pivotal

enablers of FinTech adoption. Trust (β = 0.22) served as the foundation for adoption by ensuring users' confidence in the platforms. Service quality (β = 0.312) further reinforced user satisfaction, encouraging engagement. Perceived security (β = 0.298) played a critical role in building confidence by addressing users' concerns about data safety. Among these, technological compatibility (β = 0.315) has the most substantial influence, highlighted the need for seamless integration of FinTech platforms with users' existing technologies and lifestyles. Literacy also played a significant mediating role in the relationship between FinTech adoption and financial inclusion. Digital literacy (β = 0.358) and financial literacy (β = 0.365) strengthened the positive impact of FinTech on inclusion by equipping users with the necessary skills and knowledge to utilize these platforms effectively. Findings emphasized the need for initiatives that target less-literate segments of the population to foster inclusive growth. Demographic factors, such as age, income, and education, further moderate the relationship between FinTech adoption and financial inclusion. Younger age groups, higher income brackets, and individuals with advanced education levels benefit more significantly from FinTech services. This suggested need for targeted strategies to address disparities in adoption and inclusion across different demographic segments.

The study also confirmed sustained positive impact of FinTech adoption on financial inclusion over time. With a high path coefficient (β = 0.725), this relationship underscores the long-term benefits of FinTech in bridging financial access gaps. These results highlight the transformative potential of FinTech in promoting economic empowerment, particularly when combined with efforts to improve digital literacy and address demographic disparities.

Conclusion

This study underscores the interplay between demographic characteristics, enabling factors, and behavioural traits in driving FinTech adoption and financial inclusion. The findings validated that trust, service quality, perceived security, and technological compatibility are essential enablers for adoption, while literacy levels and demographic factors enhance its effects. The study highlights the growing reliance on digital platforms among younger, urban, and educated users with high digital and financial literacy levels. However, it also identifies opportunities to target less-engaged groups, such as older individuals, rural residents, and those with low literacy levels, through focused education and outreach initiatives. The robust discriminant validity and reliability of constructs validated the model's effectiveness in analysing FinTech adoption. The sustained positive impact of FinTech adoption on financial inclusion over time reinforces its potential as a transformative tool for bridging economic disparities. It is recommended that future strategies should focus on enhancing trust, security, and technological compatibility while promoting literacy and accessibility to ensure inclusive and widespread adoption of FinTech services.

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