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FinTech and Financial Inclusion in SMEs of Afghanistan: Exploring the Moderating influences of Perceived Regulatory Support and Continued Usage Intention

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Abstract

This study focuses into the factors that influence FinTech adoption and its impact on financial inclusion (FI) in Afghanistan's small and medium-sized enterprises (SMEs). Employing the Technology Acceptance Model (TAM) and related trust-based frameworks, the study investigates the impact of perceived ease of use (PEOU), trust (TRS), service quality (SEQ), and perceived security (PES) on FinTech adoption. Additionally, it explores how FinTech usage improves financial inclusion (FI) and how this relationship is influenced by continuing usage intention (CUI) and perceived regulatory support (PRS). The data collected from SMEs participants was examined using structural equation modeling (SEM) in SmartPLS. The results reveal that PEOU ($\beta = 0.212$, $t = 4.817$, $p < .001$), TRS ($\beta = 0.199$, $t = 3.303$, $p = .001$), SEQ ($\beta = 0.248$, $t = 4.274$, $p < .001$), and PES ($\beta = 0.149$, $t = 2.359$, $p = .018$) have significant effects on FinTech usage. FinTech usage significantly predicts FI ($\beta = 0.608$, $t = 13.226$, $p < .001$). CUI ($\beta = 0.125$, $t = 3.070$, $p = .002$) did not moderate the relationship and while PRS ($\beta = 0.106$, $t = 2.610$, $p = .009$) positively moderated the association between FinTech usage and financial inclusion. These findings indicate that enhancing usability, trust, quality, and security perceptions can greatly increase FinTech adoption, improving access to financial services. Further, maintaining continuing interaction and supporting regulatory settings increases this impact. The study complements to the expanding literature on FinTech in emerging economies and has practical implications for policymakers, FinTech developers, and SMEs in Afghanistan.

Keywords: FinTech adoption, financial inclusion, SMEs, continued usage intention, regulatory support

Introduction

Financial exclusion remains an ongoing global constraint to inclusive economic progress, especially in unstable and conflict-affected areas. Despite advances in financial infrastructure and digital innovations, a significant percentage of the world's population—particularly small businesses in developing economies—is still disengaged from formal financial services, restricting their ability to access credit, invest, and grow (Senyo & Osabutey, 2020). The World Bank's Global Findex Report (Demirgüç-Kunt et al., 2022) emphasizes that structural and behavioral barriers to financial inclusion persist, particularly for SMEs, which are widely recognized as drivers of economic resilience and employment.

In response, FinTech has emerged as a successful means for addressing long-standing barriers to FI. FinTech reduces reliance on traditional banking infrastructure and improves financial access to previously underserved communities by utilizing mobile platforms, digital payments, and automated financial services (Aleemi et al., 2023; Yang & Zhang, 2022; Asif et al., 2023). FinTech provides SMEs with accessible and cost-effective options for managing transactions, acquiring loans, and engaging in digital marketplaces. Yet, the revolutionary potential of FinTech is dependent not just on access, but also on the continuous and meaningful application of these technologies.
This makes it critical to investigate the behavioral and institutional factors that influence FinTech effectiveness. CUI, or SMEs' willingness to utilize FinTech products consistently over time, is essential in evaluating whether initial adoption leads to long-term FI. Without consistent involvement, the advantages of digital financial instruments may be temporary or neglected. Similarly, PRS users' notion in the policies, regulations, and protections provided by financial authorities might influence enterprises' willingness to use and depend upon FinTech technologies. In situations where regulatory regimes are viewed as weak or ambiguous, people may be hesitant to switch to formal digital channels, regardless of technology availability.

Despite its potential to break down long-standing financial barriers, the role of FinTech in improving FI among SMEs in Afghanistan has received little attention. Afghanistan's SMEs face an adverse circumstance that includes limited access to formal loans, insufficient institutional capability, and significant levels of lack of formality (Da Afghanistan Bank, 2020). In 2018, loans to SMEs accounted for only 0.17% of GDP, but over half of Afghan businesses observed access to finance as a critical barrier. surprisingly, around 45% indicated little loan demand, indicating a divergence that is most likely due to mistrust, limited awareness, and insufficient outreach by financial institutions (Zahidi & Khan, 2019; Mohammady & Vepa, 2025). The majority of businesses rely on internal funding sources due to strict collateral requirements, an underdeveloped banking industry, and banks' limited geographic reach.

In addition, Afghanistan's legal and technology ecosystem creates structural barriers to FinTech growth and adoption. The lack of basic systems such as electronic Know Your Customer (e-KYC), real-time credit rating agencies, and comprehensive consumer protection systems weakens trust and decreases SMEs' desire to use digital financial services. As of 2020, only 11% of Afghan adults reported using digital payments (Da Afghanistan Bank, 2020), indicating not only infrastructure constraints but also behavioral hesitancies caused by inconsistent policy enforcement, digital illiteracy, and socio-cultural barriers—particularly among female-owned businesses (Shaikhzada et al., 2025; Azimi, 2025).

In light of these obstacles, this study investigates into how FinTech can improve FI among SMEs in Afghanistan, with an emphasis on the moderating impacts of PRS and CUI. It particularly investigates if trust in regulatory frameworks and intention to use FinTech have a continuous impact on the strength of the relationship between FinTech adoption and financial inclusion outcomes. By including these moderating factors, the study helps to provide a deeper comprehension of FinTech adoption dynamics in fragile states, as well as actionable insights for policymakers, financial institutions, and technology providers working to promote inclusive financial ecosystems in Afghanistan and other contexts.

Research Objectives

- To examine the impact of PEOU on the use of FinTech among SMEs in Afghanistan.
- To assess the influence of TRS on FinTech use among SMEs.
- To evaluate the effect of SEQ on the adoption of FinTech services.
- To investigate the role of PES in shaping FinTech use.
- To analyze the relationship between FinTech use and FI among SMEs.
- To explore the moderating effect of CUI on the relationship between FinTech use and financial inclusion.
- To examine the moderating role of PRS in the relationship between FinTech use and financial inclusion.

Literature Review

Theoretical Foundation

This study is based on many interconnected hypotheses that collectively explain the factors influencing FinTech adoption and its impact on financial inclusion (FI), as shown in the suggested conceptual framework.

The TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003) are the key theoretical foundations for studying how users embrace FinTech platforms. TAM highlights PEOU as an important factor in determining user adoption of technology. UTAUT expands on this by introducing new constructs such as TRS, SRQ, and PES, which are particularly significant in the context of digital financial services, where uncertainty and perceived risks are high.

UTAUT additionally acknowledges the importance of PRS and CUI as enabling conditions. In this theory, PRS and CUI are viewed as moderators which influence the strength of the relationship between FinTech use and FI. Users, for example, are more likely to achieve inclusive financial results when their continuing participation is supported by a favorable evaluation of regulatory frameworks and a strong intention to continue using the service.

The Resource-Based View (RBV) (Barney, 1991) contributes to this study by framing FinTech use as a strategic skill that can help firms achieve financial inclusion, particularly when accompanied by sustained usage habits like CUI. Furthermore, Expectation Confirmation Theory (ECT) (Oliver, 1980) is useful in explaining CUI. According to ECT, outstanding customer experiences with FinTech platforms increase satisfaction and lead to prolonged engagement, which is critical for achieving long-term advantages such as improved FI.

Furthermore, the Perceived Risk Theory (Featherman & Pavlou, 2003) supports the inclusion of TRS and PES in the model. Users in the digital financial field frequently weigh perceived risks such as fraud, data misuse, and system stability before adopting or continuing to use FinTech services. Improving trust and lowering perceived risk are thus critical for improving adoption and sustained involvement. Together, these theories provide an extensive and complementary framework for understanding the causes, consequences, and contingencies of FinTech use and FI, particularly in fragile and underbanked environments such as Afghanistan.

Perceived Ease of Use

PEOU remains a foundational determinant in FinTech adoption, particularly for SMEs with limited digital literacy and time. Empirical evidence shows that when users perceive a system as easy to use, they are more likely to adopt it (Nugraha et al., 2022; Efendi et al., 2024; Chin et al., 2021). During COVID-19, ease of use, coupled with usefulness and support mechanisms, was found essential for technology uptake among SMEs (Nugraha et al., 2022). In both Islamic FinTech (Mahmoud et al., 2025) and broader contexts like QRIS and P2P lending, PEOU shaped trust, reuse intention, and behavior (Kurniasari & Utomo, 2019; Rahadian & Thamrin, 2023; Lusiana et al., 2025; Rahmalia et al., 2024). Several studies show that PEOU often exerts more influence than perceived usefulness or even acts independently of it (Efendi et al., 2024; Lusiana et al., 2025). In digital payment and e-money systems, ease of use was linked to behavioral intention, enjoyment, and satisfaction, especially when paired with trust and literacy (Jasin, 2022; Kurniasari & Abd Hamid, 2020; Ikwanto & Indriani, 2024; Rahmawati & Merlinda, 2024). Usability thus remains critical across systems and geographies (Edo et al., 2024).

Perceived Security

Perceived security consistently plays a pivotal role in FinTech adoption by fostering trust, satisfaction, and behavioral intention across various platforms. In P2P lending and mobile payments, security enhances trust and shapes user intentions (Utami & Soesetyo, 2023; Najib et al., 2021). Similar mechanisms were observed in e-wallet and mobile wallet use, where security—via trust—drives adoption (Zena & Susanto, 2022; Salah & Ayyash, 2024; Sa'diyah & Soegoto, 2021). Structural modeling confirms this pattern across mobile banking and wallets, with security directly and indirectly promoting usage (Almaiah et al., 2023; Chand et al., 2025). Numerous studies in Indonesia, China, Bangladesh, and rural Pakistan further reinforce perceived security as a key determinant or mediator in digital financial engagement (Khoiriyah et al., 2023; Tang et al., 2021; Ali et al., 2021; Islam et al., 2024; Hidayat ur Rehman et al., 2025). Collectively, these findings highlight that secure platforms and transparent privacy controls are essential for building trust and encouraging sustained FinTech adoption.

Trust

Trust is a critical enabler in FinTech adoption, transforming user expectations and system quality into usage behavior, especially where digital literacy is low (Alamoudi et al., 2025; Al-Qudah et al., 2025; Appiah & Agblewornu, 2025; Wang et al., 2024; Khan et al., 2023). Regulatory support, IT infrastructure, and ethical considerations like privacy and brand image further enhance trust (Singh & Sharma, 2024; Nguyen et al., 2024; Pratama, 2021; Vasquez & San-Jose, 2022; Zhang et al., 2023). Studies also show trust mediates adoption in various contexts, reinforced by trust propensity, government support, and brand credibility (Balaskas et al., 2024; Ashrafi et al., 2022; Zhao et al., 2024; Garad et al., 2025). Its role is confirmed across sectors like banking, healthcare, and MSMEs (Gupta et al., 2023; Elsaman et al., 2024; Hassan et al., 2022; Noreen, 2023).

Service Quality

SRQ is a key driver of FinTech adoption and satisfaction across frameworks like SERVQUAL, TAM, and UTAUT2 (Sharma et al., 2023, 2024; Chand et al., 2025). Dimensions such as reliability, responsiveness, and tangibles enhance perceived ease of use and usefulness, directly influencing behavioral intention. High SRQ also reduces uncertainty and fosters trust, promoting long-term usage (Ryu & Ko, 2020; Alwi et al., 2019). Evidence from India, Pakistan, Malaysia, and Ethiopia confirms its impact on satisfaction, adoption, and e-loyalty, especially through user-friendly interfaces and prompt service (Verma, 2023; Jerene & Sharma, 2020). Thus, SRQ remains vital for boosting FinTech engagement globally.

FinTech and Financial Inclusion

FinTech is widely recognized as a key driver of FI, especially in developing and underserved regions. Digital financial services like mobile money, digital credit, and payment platforms expand access for unbanked populations (Morgan, 2022; Makina, 2019; Salampasis & Mention, 2018), supported by infrastructure innovations such as digital identities and interoperable systems that reduce barriers in line with SDGs (Arner et al., 2020; Zetzsche, Buckley, & Arner, 2019). In India, mobile wallets and P2P lending notably improve rural financial access (Asif et al., 2023; Gupta & Sharma, 2020; Yadav & Shankar, 2021).

FinTech enhances credit availability by reaching riskier borrowers through alternative data, promoting more inclusive lending (Jagtiani & Lemieux, 2017; Rosyadah et al., 2021; Umar et al., 2025). It also reduces transaction costs and improves accessibility, though regulatory quality, infrastructure, and trust moderate these effects (Lai et al., 2022; Ozili, 2018; Rahman & Das, 2022). Regional evidence from Sub-Saharan Africa and South Asia confirms these benefits while emphasizing supportive policies (Mohamed & Otake, 2025; Zins & Weill, 2016).

Research shows FinTech adoption among SMEs positively affects financial behavior, entrepreneurship, and economic inclusion (Anggara & Nuraeni, 2025; Omowole et al., 2024; Risman et al., 2022), with impacts on banking competition and market dynamics (Aleemi, Javaid, & Hafeez, 2023). Addressing digital literacy and fostering multi-stakeholder collaboration remain vital to fully realize FinTech's inclusive potential and reduce social inequalities (Cosma & Rimo, 2023; Danladi et al., 2023).

Perceived Regulatory Support

PRS is crucial for FinTech adoption and FI by fostering trust, transparency, and enabling environments. Studies show that government-backed financial literacy initiatives and clear regulatory reforms enhance FinTech access, especially for youth and underserved groups (Noreen et al., 2022; Jabbar et al., 2019; Muneeza & Mustapha, 2021; Wulandari & Kassim, 2016), with culturally aligned frameworks boosting confidence in Islamic finance.

Regulatory clarity and supportive infrastructure convert FinTech availability into actual usage. Digital ID programs, simplified licensing, and transparent policies mediate adoption (Sharma et al., 2023; Demirgüç-Kunt et al., 2022), while regulatory flexibility such as sandboxes fosters trust and lowers barriers (Arner et al., 2016; Ozili, 2018). Empirical evidence links PRS positively to consumer trust and adoption through government incentives and transparent environments (Chen et al., 2021; Osman et al., 2021; Zavolokina et al., 2016; Opiyo et al., 2024; Pyoko et al., 2023), particularly among SMEs and marginalized groups.

Effective regulation mitigates risks of early adoption, promoting stable inclusion (Chinoda & Kapingura, 2024; Gichuru & Namada, 2022). Collaborative regulatory frameworks balance innovation and protection, enhancing inclusion (Vijayagopal et al., 2024; Abaidoo & Agyapong, 2024). Higher regulatory quality correlates with increased FinTech use and financial account ownership, as shown in Jordan and cross-national studies (Al-afeef et al., 2024; Chen & Divanbeigi, 2019). Overall, PRS drives inclusive financial ecosystems by building trust, reducing barriers, and promoting safe, efficient services.

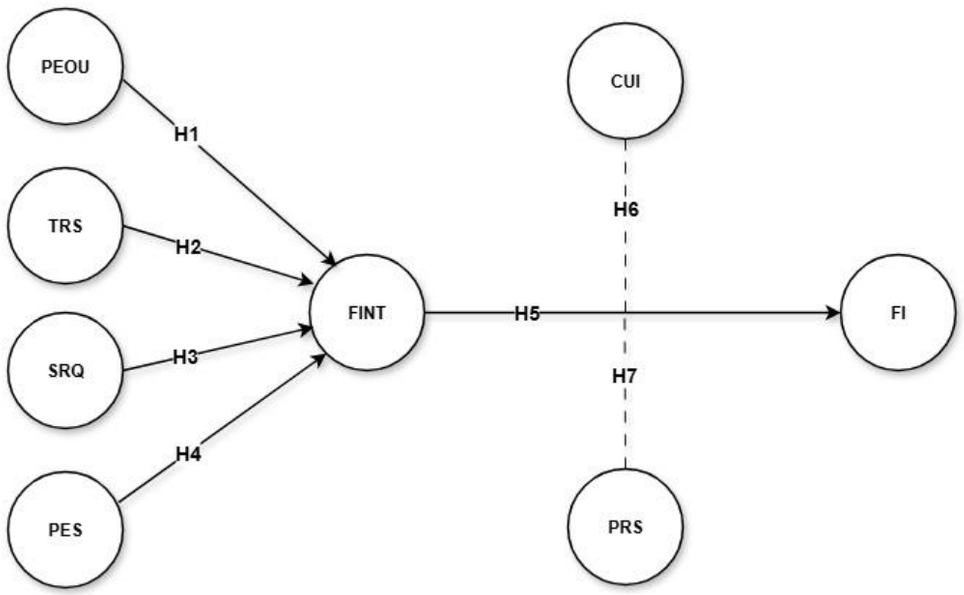
Continued Usage Intention

CUI is crucial for sustaining the long-term benefits of digital financial tools on FI, especially among users with varying DFL levels. Research shows that while initial FinTech adoption is important, habitual use driven by trust, perceived usefulness, satisfaction, and user-centric design ultimately promotes deeper inclusion (Elangovan & Babu, 2024; Basri et al., 2021; Gui et al., 2024; Amelia et al., 2024; Özbek, 2025). These factors are vital for populations with limited digital or financial skills.

Studies highlight perceived value, trust, and performance expectancy as key mediators shaping CUI, where benefits like convenience and security encourage sustained use (Rizvee et al., 2025; Le et al., 2020; Mushtaq, 2024; Nguyen & Dao, 2024; Mandari & Koloseni, 2025). Theoretical models like UTAUT and Expectation Confirmation confirm satisfaction, habit, and social influence as predictors of continued FinTech use (Odoom & Kosiba, 2020; Ramindran & Lee, 2024; Jangir et al., 2022; Khayer et al., 2023; Sanchez & Tanpoco, 2023). Maintaining trust and consistent SRQ is key to engaging underserved users and microenterprises.

Contextual and demographic factors such as gender, age, and rural-urban divides moderate CUI's development, with rural incentives and habitual behaviors shaping engagement patterns (Lakshmanan & Shanmugavel, 2025; Bacha et al., 2025). DFL further enhances CUI's positive impact on inclusion when combined with trust-based service models (Pal et al., 2020; Putritama, 2019). Overall, evidence confirms that CUI amplifies DFL's effect on inclusion by promoting repeated FinTech use, aligning with the moderation effect found in this study among SMEs.

Conceptual Framework



The conceptual framework illustrates how various technological and behavioral factors influence the use of FinTech, which subsequently impacts FI among SMEs in Afghanistan. The model begins with four core constructs PEOU, TRS, SEQ, and PES that are theorized to positively influence FinTech use. PEOU reflects the degree to which users believe that using FinTech tools will be effortless, while trust indicates the confidence users have in the reliability and integrity of these services. SEQ encompasses aspects such as responsiveness, reliability, and overall user satisfaction with FinTech platforms, and PES pertains to the level of safety users feel when conducting transactions or sharing personal information through these technologies.

FinTech use, as the central construct, is expected to be shaped by these antecedents and is positioned as a direct driver of FI. However, the relationship between FinTech use and FI is not assumed to be linear or direct in all cases. CUI and PRS are proposed as moderators. CUI reflects the users' willingness to keep engaging with FinTech platforms over time, while PRS captures the extent to which users feel that the regulatory environment facilitates safe and reliable FinTech usage. These moderating factors are believed to strengthen the impact of FinTech use on financial inclusion, making the relationship more robust when both are present. Overall, the framework integrates key theoretical perspectives to offer a comprehensive view of the pathways through which FinTech adoption can promote financial inclusion in emerging markets.

Hypothesis Development

H1: PEOU has a positive influence on FinTech use.
H2: TRS has a positive influence on FinTech use.
H3: SEQ has a positive influence on FinTech use.
H4: PES has a positive influence on FinTech use.
H5: FinTech use has a positive influence on FI.
H6: CUI positively moderates the relationship between FinTech use and FI.
H7: PRS positively moderates the relationship between FinTech use and FI.

Research Methodology

Research Philosophy and Paradigm

The study is grounded in a positivist research paradigm, which emphasizes empirical testing, objective measurement, and hypothesis-driven inquiry. This philosophical stance aligns with the study's emphasis on quantifiable constructs such as FinTech adoption, DFL, CUI, and PRS. By relying on validated survey instruments, the research seeks to

produce generalizable and replicable results that contribute to a broader understanding of FinTech's impact within the context of Afghanistan's financial ecosystem. The positivist orientation supports a systematic investigation of cause-effect relationships, essential for informing policy and practice in the FinTech domain.

Research Approach and Design

A deductive approach is employed in this research, as it begins with the formulation of hypotheses derived from established theoretical models and prior empirical studies. These hypotheses are tested through the collection and analysis of primary data from Afghan SMEs. Given the constraints related to time and accessibility, a cross-sectional design was selected, allowing data to be gathered at a single point in time. Although this limits the ability to infer causality, it is appropriate for identifying patterns and associations among variables. PLS-SEM was chosen as the core analytical technique due to its robustness in dealing with small to medium sample sizes, its tolerance for non-normal data distributions, and its strength in assessing mediation and moderation effects simultaneously. This approach ensures methodological rigor while accommodating the contextual limitations of data collection in Afghanistan.

Population and Sampling

The target population for this study comprises owners and managers of SMEs in Afghanistan who actively use or have experience with FinTech services. Given the specialized nature of the topic, purposive sampling was employed to ensure that participants possessed relevant knowledge and engagement with digital financial platforms. This method enhances the relevance and validity of the data collected. The appropriate sample size was determined using G*Power analysis, which indicated that a minimum of 160 responses would be sufficient to detect medium effect sizes with a statistical power of 95%. This sampling strategy ensures both feasibility and analytical adequacy, balancing the need for rigor with the practical challenges of conducting research in a post-conflict setting.

Measurement Constructs, Indicators, and Sources

The study used a number of validated measuring constructs, each evaluated with several items derived from known sources. The PEOU was obtained using Davis's (1989) work. TRS was based on Singh and Srivastava (2018), Kumar et al. (2018), and Chandra et al. (2010). SRQ was measured in accordance with Zhou (2013). Swilley (2010) proposed a measurement approach called PES. CUI is derived from Venkatesh et al. (2012) and Kumar et al. (2018). FinTech Use sourced from (Venkatesh et al., 2012). FI adapted from Bongomin and Ntayi (2020). Finally, PRS was investigated using Chandra et al. (2010).

Research Instrument

Data were collected using a structured questionnaire designed to measure the key constructs of the study, including FinTech use, DFL, PRS and CUI. Each construct was operationalized through multiple items measured on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." The questionnaire was adapted from validated instruments used in prior studies to ensure content validity. Prior to the main data collection, a pilot test involving 30 SME respondents was conducted to assess the clarity, reliability, and cultural relevance of the items. Feedback from the pilot led to minor revisions, enhancing the instrument's overall validity and user-friendliness.

Data Collection and Analysis

A mixed-mode collection method was employed to increase response rates and accessibility. Questionnaires were provided both online and in-person, providing greater access across areas and levels of digital literacy. Descriptive statistics were compiled using SPSS to summarize respondent characteristics and provide an overview of the information collected. Cronbach's Alpha and AVE were used to assess reliability and convergent validity. SmartPLS 4 was used to carry out SEM on the suggested relationships, with an emphasis on PRS and CUI's moderating role. Bootstrapping with 5,000 subsamples was used to figure out the statistical significance of the model variables.

Results and Analysis

Table 1: Demographic Profile of Respondents

Demographics	Categories	Frequency	Percentage
Gender	Male	558	93%
	Female	42	7%
Age	18-24 years	24	4%
	25-34 years	135	22.5%
	35-44 years	294	49%

Demographics	Categories	Frequency	Percentage
	45-54 years	129	21.5%
	55+ years	18	3%
Education Level	No formal education	6	1%
	Primary education	63	10.5%
	Secondary education	318	53%
	Bachelor's degree	156	26%
	Master's degree	57	9.5%
Business Sector	Retail	90	15%
	Manufacturing	90	15%
	Services	282	47%
	Agriculture	75	12.5%
	IT/Technology	48	8%
	Other	15	2.5%
Business Role	Owner	153	25.5%
	Finance Manager/Accountant	87	14.5%
	Operations Manager	231	38.5%
	IT/Technical Lead	63	10.5%
	Other	66	11%
Business Size (Employees)	Micro (1-9)	69	11.5%
	Small (10-49)	345	57.5%
	Medium (50-249)	186	31%
Business Age	<1 year	21	3.5%
	1-3 years	69	11.5%
	4-7 years	309	51.5%
	>7 years	201	33.5%
Region	Central	150	25%
	Eastern	120	20%
	Northern	120	20%
	Southern	90	15%
	Western	108	18%
	Other	12	2%

Source: Author's Compilation

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A total of 600 SME participants across various regions of Afghanistan contributed to the study examining the relationship between FinTech use and FI. The sample was predominantly male (*n = 558, 93%*), reflecting the male-dominated SME landscape in Afghanistan, while only *7%* (*n = 42*) were female. Most respondents were aged 35–44 years (*n = 294, 49%*), followed by those aged 25–34 (*n = 135, 22.5%*) and 45–54 (*n = 129, 21.5%*), indicating a concentration of middle-aged participants involved in SME leadership and FinTech adoption.

Regarding education, 53% (*n = 318*) held secondary school certificates, 26% (*n = 156*) had bachelor's degrees, and 9.5% (*n = 57*) held master's degrees, while only 1% (*n = 6*) reported no formal education. Service-based SMEs were most represented (*n = 282, 47%*), followed by manufacturing and retail (*n = 90, 15%*), agriculture (*n = 75, 12.5%*), IT/technology (*n = 48, 8%*), and other sectors (*n = 15, 2.5%*).

Participants held various organizational roles: operations managers (*n = 231, 38.5%*), owners (*n = 153, 25.5%*), financial/accounting staff (*n = 87, 14.5%*), IT/technical leads (*n = 63, 10.5%*), and others (*n = 66, 11%*). Most respondents worked in small-sized firms (*10–49 employees; n = 345, 57.5%*), followed by medium-sized (*50–249 employees; n = 186, 31%*) and micro-enterprises (*1–9 employees; n = 69, 11.5%*). The majority of businesses had operated for 4–7 years (*n = 309, 51.5%*) or over 7 years (*n = 201, 33.5%*).

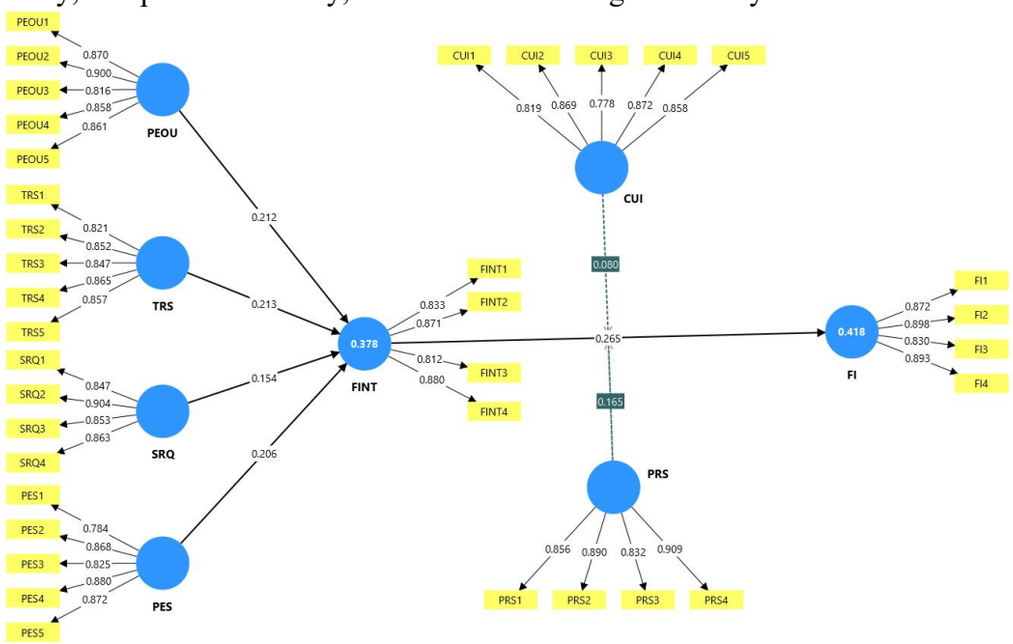
Regionally, 25% (*n = 150*) of respondents were from Central Afghanistan 20% (*n = 120*) from Eastern and Northern areas, 18% (*n = 108*) from the Western region, 15% (*n = 90*) from the South, and 2% (*n = 12*) from other, less connected provinces. This demographic diversity enhances the generalizability of the findings and supports the study's objective to capture a comprehensive view of FinTech use and FI across Afghanistan's SMEs landscape.

Common Method Bias Test (CMB)

To identify the presence of CMB, a full collinearity test was carried out with VIF values, as recommended by Kock (2015). According to this approach, if all VIF values fall below the conservative threshold of *3.30*, the model is free of considerable common method bias. The results revealed that all indicator-level VIF values ranged between *1.966* and *3.420*. Although one item (PEOU2) had a slightly higher VIF of *3.420*, it remained within the acceptable range. All other items had VIF values that were significantly below the *3.30* threshold (e.g., *FINT1 = 1.966, TRS1 = 2.124, CUI3 = 2.033, PES1 = 1.968*), indicating an absence of multicollinearity and a low risk of common method variance. Given that the majority of the VIF values are well below the threshold, it is acceptable to conclude that common method bias is not an important issue in this study. This improves confidence in the measurement model's reliability and validity, as well as the results' integrity.

Measurement Model Assessment

The measurement model's internal consistency, indicator reliability, and convergent validity were assessed using key indicators such as item cross loadings, the VIF for collinearity, Cronbach's alpha for internal consistency, composite reliability, and AVE for convergent validity.



Source: Smartpls output

Table 2: Indicator Loadings, VIF, Reliability, and Convergent Validity

Constructs	Items	Loadings	VIF	Alpha	Composite Reliability	AVE
Financial Inclusion	FI1	0.875	2.354	0.897	0.928	0.763

Constructs	Items	Loadings	VIF	Alpha	Composite Reliability	AVE
	FI2	0.897	3.180			
	FI3	0.827	2.217			
	FI4	0.893	2.656			
FinTech	FINT1	0.837	1.966	0.872	0.912	0.721
	FINT2	0.870	2.542			
	FINT3	0.810	1.994			
	FINT4	0.879	2.393			
Perceived Ease of Use	PEOU1	0.870	2.745	0.913	0.935	0.742
	PEOU2	0.900	3.420			
	PEOU3	0.816	2.222			
	PEOU4	0.858	2.496			
	PEOU5	0.861	2.488			
Perceived Security	PES1	0.785	1.968	0.901	0.927	0.717
	PES2	0.868	2.835			
	PES3	0.824	2.281			
	PES4	0.880	2.751			
	PES5	0.872	2.671			
Service Quality	SRQ1	0.847	2.223	0.890	0.924	0.752
	SRQ2	0.904	3.201			
	SRQ3	0.852	2.250			
	SRQ4	0.863	2.319			
Trust	TRS1	0.822	2.124	0.903	0.928	0.720
	TRS2	0.852	2.578			
	TRS3	0.847	2.528			
	TRS4	0.865	2.528			
	TRS5	0.857	2.478			
Continued Usage Intention	CUI1	0.819	2.191	0.896	0.923	0.705
	CUI2	0.869	2.922			
	CUI3	0.778	2.033			
	CUI4	0.872	2.575			

Constructs	Items	Loadings	VIF	Alpha	Composite Reliability	AVE
	CUI5	0.858	2.426			
Perceived Regulatory Support	PRS1	0.856	2.305	0.895	0.927	0.761
	PRS2	0.890	2.983			
	PRS3	0.832	2.118			
	PRS4	0.909	2.905			

Source: Author's compilation

Indicator Loadings and Multicollinerity Analysis

To determine the measurement model's reliability and validity, indicator loadings and VIF values were investigated. According to Hair et al. (2021), indicator loadings more than 0.70 are acceptable, indicating that the item accounts for a significant percentage of the variance in the latent construct. In addition, VIF values less than *5.00* indicate that multicollinearity is not an issue (Diamantopoulos & Siguaw, 2006).

All indicators in the model had significant standardized loadings, ranging from *0.778* to *0.909*, which exceeded the required threshold of 0.70. For example, item loadings for FI ranged from *0.827* (FI3) to *0.897* (FI2), while FinTech ranged from *0.810* (FINT3) to *0.879* (FINT4). In a similar vein item for PEOU had high loadings, with PEOU2 at *0.900* and PEOU3 at *0.816*. In a comparable manner loading for PES ranged from *0.785* (PES1) to *0.880* (PES4), while SRQ items loaded from *0.847* (SRQ1) and *0.904* (SRQ2). TRS, CUI, and PRS also had strong item loadings, all above *0.80*. Concerning multicollinearity, all indicator VIF values fell below the strict criterion of 5.00, ranging from *1.966* to *3.420*. For example, FINT1 had the lowest VIF value of *1.966*, while PEOU2 had the highest, *3.420*. These findings suggest that collinearity among the indicators is not a concern. In general, the high factor loadings and suitable VIF values show the constructs are reliably measured and that multicollinearity is not an issue to the model.

Internal Consistency Reliability Assessment

Cronbach's alpha (α) and CR were utilized to determine internal consistency reliability, following Hair et al.'s (2021) recommendations. Both measures assess the degree to which items within a construct are correlated while consistently measuring the same latent variable. A Cronbach's alpha value of *0.70* or above is regarded as suitable for exploratory research, while composite reliability values more than *0.70* indicate adequate internal consistency (Hair et al., 2021).
The findings showed that all constructs met or above the required criteria. FI demonstrated strong internal consistency ($\alpha = 0.897, CR = 0.928$). FinTech had $\alpha = 0.872$ *and* $CR = 0.912$, however PEOU had even higher reliability with $\alpha = 0.913$ *and* $CR = 0.935$. The constructs of PES ($\alpha = 0.901, CR = 0.927$), SRQ ($\alpha = 0.890, CR = 0.924$), and TRS ($\alpha = 0.903, CR = 0.928$) exhibited significant internal consistency. Additionally, CUI ($\alpha = 0.896, CR = 0.923$) and PRS ($\alpha = 0.895, CR = 0.927$) demonstrated adequate reliability.

Convergent Validity

Convergent validity was determined by examining the AVE for each latent construct. According to the recommendations provided by Fornell and Larcker (1981), an AVE value of *0.50* or greater shows that the construct explains more than half of the variance of its indicators, indicating sufficient convergent validity. All constructs had AVE values much higher than the minimum requirement of *0.50*. Specifically, FI had an AVE of *0.763*, FinTech had an AVE of *0.721*, and PEOU had an AVE of *0.742*. In a similar vein PES had an AVE of *0.717*, SRQ had an AVE of *0.752*, and TRS had an AVE of *0.720*. In addition, the AVE values for CUI and PRS were *0.705* and *0.761*, respectfully. These findings show that all constructs meet the criteria for convergent validity, meaning that the items within each construct share significant amounts of variance and are effectively evaluating their respective latent variables.

Discriminant Validity Assessment

Two commonly used methods were employed to test discriminant validity among the structural model's latent constructs: the Fornell-Larcker criterion and the Heterotrait-Monotrait Correlation Ratio (HTMT).

Table 3: Fornell-Larcker Criterion (Diagonal), Correlations (Above Diagnol), and HTMT Ratios (Below Diagnal)

Construct	CUI	FI	FINT	PEOU	PES	PRS	SRQ	TRS
CUI	**0.840**	0.501	0.497	0.476	0.522	0.515	0.542	0.496

Construct	CUI	FI	FINT	PEOU	PES	PRS	SRQ	TRS
FI	0.546	**0.873**	0.508	0.475	0.535	0.506	0.469	0.480
FINT	0.550	0.563	**0.850**	0.481	0.499	0.491	0.445	0.490
PEOU	0.516	0.516	0.530	**0.861**	0.500	0.458	0.404	0.485
PES	0.568	0.580	0.550	0.547	**0.846**	0.511	0.522	0.502
PRS	0.562	0.552	0.543	0.500	0.557	**0.872**	0.503	0.458
SRQ	0.599	0.515	0.499	0.446	0.578	0.558	**0.867**	0.461
TRS	0.543	0.524	0.544	0.529	0.550	0.501	0.511	**0.849**

Source: Author's compilation

Fornell-Larcker Criterion

Fornell and Larcker (1981) defined discriminant validity as the square root of the AVE for each construct (shown diagonally in the correlation matrix) that is greater than its correlation with any other construct. In the present study, all constructs met the requirement. For example, the square root of AVE for CUI was *0.840*, surpassing its associations with FI (*0.501*), FinTech (*0.497*), and other variables. Similarly, some constructs, including FI (*0.873*), FINT (*0.850*), PEOU (*0.861*), PES (*0.846*), PRS (*0.872*), SRQ (*0.867*), and TRS (*0.849*), had diagonal values greater than their respective inter-construct correlation. These findings show that discriminant validity is achieved using the Fornell-Larcker criterion.

HTMT Ratios

The HTMT ratio of correlations was further examined as a stricter test of discriminant validity. HTMT levels less than *0.90* are considered acceptable, whereas values less than *0.85* are suggested for higher-level evaluations (Henseler et al., 2015). All HTMT levels in this investigation fell below the stricter criterion of *0.85*. For example, the HTMT ratios between CUI and FI were *0.546*, FI and FINT were *0.563*, and PES and PRS were *0.557*. These values support the notion that each construct differs empirically from the others. The Fornell-Larcker and HTMT results, taken together, give strong evidence that the measurement model has discriminant validity.

4.6. Structural Model Results

Table 4: Hypotheses Testing Results

Hypothesis	Path	β (O)	t-value	p-value	95% CI (LL – UL)	Decision
H1	**PEOU → FINT**	0.212	4.817	0.000	[0.124, 0.298]	Accepted
H2	**TRS → FINT**	0.213	4.852	0.000	[0.126, 0.299]	Accepted
H3	**SRQ → FINT**	0.154	3.446	0.001	[0.068, 0.242]	Accepted
H4	**PES → FINT**	0.206	4.393	0.000	[0.114, 0.298]	Accepted
H5	**FINT → FI**	0.265	6.138	0.000	[0.182, 0.352]	Accepted
H6	**CUI × FINT → FI (Moderation)**	0.080	1.713	0.087	[–0.008, 0.174]	Rejected
H7	**PRS × FINT → FI (Moderation)**	0.165	3.231	0.001	[0.066, 0.261]	Accepted

Source: Author's compilation

The structural model findings revealed statistically significant relationships for six of the seven hypothesized paths. PEOU significantly positive impact FINT (*β = 0.212, t = 4.817, p <.001, 95% CI [0.124, 0.298]*), confirming hypothesis 1. TRS has been shown to be positively associated with FINT (*β = 0.213, t = 4.852, p <.001, 95% CI [0.126, 0.299]*), supporting hypothesis 2. SRQ had a significant positive effect on FINT (*β = 0.154, t = 3.446, p =.001, 95% CI [0.068, 0.242]*), supporting hypothesis 3. H4 was

supported as PES positively impacted FINT (*β = 0.206, t = 4.393, p <.001, 95% CI [0.114, 0.298]*). FINT strongly predicted FI (*β = 0.265, t = 6.138, p <.001, 95% CI [0.182, 0.352]*), supporting hypothesis 5.

However, H6, which expected a moderating effect of CUI on the association between FINT and FI, was not confirmed (*β = 0.080, t = 1.713, p =.087, 95% CI [-0.008, 0.174]*). The interaction effect was not statistically significant. H7 was validated, showing that PRS significantly moderates the association between FINT and FI (*β = 0.165, t = 3.231, p =.001, 95% CI [0.066, 0.261]*), suggesting that regulatory support enhances the effect of FinTech on the latter.

Table 5: Moderation Effects of CUI and PRS

Interaction Term	Path Coefficient (β)	t-value	p-value	Result
CUI × FINT → FI	0.080	1.713	0.087	Not Supported
PRS × FINT → FI	0.165	3.231	0.001	Supported

Source: Author's compilation

Table 5 presents the findings of the moderation analysis, which examined the interaction effects of CUI and PRS on the relationship between FINT and FI. The interaction between CUI and FINT was not statistically significant (*β = 0.080, t = 1.713, p =.087*). This indicates that continuing usage intention does not significantly moderate the effect of FinTech adoption on FI. However, the interaction between PRS and FINT had a significant positive influence on FI (*β = 0.165, t = 3.231, p <.001*), showing that PRS improves the relationship between FinTech adoption and FI.

Table 6: Explanatory power of the Structural Model

Construct	R^2	R^2 Adjusted	Interpretation
FI	0.418	0.413	Moderate to large explained variance
FINT	0.378	0.373	Moderate explained variance

Source: Author's compilation

The model accounts for 41.3% of the variance in FI ($R^2 = 0.418$, adjusted $R^2 = 0.413$), indicating a moderate to significant level of explained variance. Similarly, the R^2 result for FinTech was *0.378*, with an adjusted R^2 of *0.373*, meaning that approximately *37.3%* of the variance in FINT was accounted for by the predictors, indicating a moderate level of explained variance. These findings show that the model provides enough explanatory power for both constructs.

Table 7: Predictive Validity of the Structural Model

Construct	Q^2predict	RMSE	MAE	Interpretation
FI	0.414	0.768	0.574	Moderate predictive relevance
FINT	0.365	0.800	0.608	Moderate to strong predictive relevance

Source: Author's compilation

The structural model's predictive relevance was evaluated using the Q^2_predict statistic, as well as RMSE and MAE. The Q^2_predict values indicate the model's ability to predict the observed values of the endogenous constructs. Values over zero indicate sufficient predictive relevance.
The predictive relevance (Q^2) for FI was *0.414*, showing modest predictive significance. The related Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) values were *0.768* and *0.574*, respectively, confirming the model's prediction accuracy for this construct. For FinTech, the Q^2 value was *0.365*, indicating moderate to strong predictive relevance. Corresponding RMSE and MAE values were *0.800* and *0.608*, indicating acceptable prediction accuracy. Overall, the results show that the model has reasonable predictive performance for both constructs. These findings show that the structural model has sufficient predictive accuracy, particularly in predicting FinTech adoption outcomes, demonstrating the proposed framework's robustness and utility in practice.

Discussion of Results

The aim of this study was to look at the factors that drive FinTech adoption and its impact on FI among Afghanistan's SMEs, as well as the moderating effects of PRS and CUI. The findings help enhance theoretical understanding and policy relevance by showing how behavioral, technological, and contextual factors all influence FinTech-driven FI in weak economies.

The study found that PEOU has a significant effect on FinTech adoption among SMEs (*β = 0.212, p < 0.001*). This is in line with previous research indicating that easy-to-use digital platforms enhance adoption rates. Nugraha et al. (2022) and Efendi et al. (2024) discovered that usability, particularly during crises such as the COVID-19 pandemic, was crucial for small businesses adopting new technologies. Similar findings by Chin et al. (2021) *and* Rahadian and Thamrin (2023) indicate that the PEOU not only promotes adoption, but also improves trust and long-term use in systems such as Islamic FinTech and QR payments. The Afghanistan context, which is characterized by low

digital literacy and infrastructural restrictions, emphasizes the importance of usability as a factor of adoption, demonstrating how ease of use can reduce psychological and operational challenges for SMEs (Lusiana et al., 2025; Kurniasari and Utomo, 2019).

Trust was found to have a strong positive effect on FinTech use (β = 0.213, p < 0.001), supporting Hypothesis 2 and establishing the vital relevance of trust in FinTech adoption research. Alamoudi et al. (2025), Appiah and Agblewornu (2025), and Wang et al. (2024) found that trust mediates the association between user perceptions and system use, particularly in low-literacy or high-uncertainty environments. Trust is especially important in environments like Afghanistan, where government bodies and financial service providers are often distrusted. Prior research has also confirmed that trust can be built through visible regulatory support, secure data handling, and consistent service experiences (Nguyen et al., 2024; Vasquez & San-Jose, 2022; Balaskas et al., 2024), all of which are underdeveloped in Afghanistan, making trust a substitute for institutional strength.

SRQ had a significant positive impact on FinTech usage (β = 0.154, p < 0.001), validating Hypothesis 3. This finding aligns with Sharma et al. (2023, 2024) and Jerene and Sharma (2020), who concluded that responsiveness, reliability, and tangibility improve user satisfaction and adoption. High service quality lowers ambiguity and increases user confidence, particularly in fragile contexts where service gaps are widespread. In Afghanistan, SMEs are more likely to use FinTech platforms that provide clear user interfaces, immediate support, and rapid transaction procedures, confirming findings from Verma (2023) and Ryu and Ko (2020), which connect service quality to both initial adoption and long-term loyalty.

PES significantly influenced FinTech use (*β = 0.206, p < 0.001*), supporting Hypothesis 4. This finding supports previous research, which demonstrated that security perceptions are directly related to trust, behavioral intention, and usage, particularly in digital payment systems (Utami & Soesetyo, 2023; Najib et al., 2021). Zena and Susanto (2022) and Salah and Ayyash (2024) found that perceived security is not only a direct predictor of adoption, but also an indirect enabler through trust enhancement. Because of limited institutional protections, Afghanistan SMEs are concerned about fraud, privacy, and system vulnerabilities, making perceived security a critical gateway to adoption. This is consistent with broader regional findings from Pakistan, Bangladesh, and China, where FinTech adoption is highly associated with security confidence (Islam et al., 2024; Hidayat ur Rehman et al., 2025).

The study demonstrated a significant positive relationship between FinTech use and FI (*β = 0.265, p < 0.001*), supporting Hypothesis 5. This is in accordance with a significant number of research showing FinTech's ability to increase financial access, lower transaction costs, and overcome geographic or infrastructure limitations (Morgan, 2022; Makina, 2019; Arner et al., 2020). In fragile environments like Afghanistan, where traditional financial systems have limited reach and accessibility, FinTech provides scalable and more inclusive alternatives. Digital financial services, as found in Sub-Saharan Africa, South Asia, and India, can increase credit availability, improve financial behavior, and drive economic engagement for SMEs (Gupta & Sharma, 2020; Umar et al., 2025; Aleemi et al., 2023). However, the inclusive benefits of FinTech rely on supportive infrastructure, regulatory clarity, and user participation, emphasizing the need for a comprehensive enabling environment (Ozili, 2018; Lai et al., 2022).

The investigation of moderating effects revealed varied findings. Hypothesis 6 was rejected as there was no significant interaction between FinTech use and CUI on FI (*β = 0.080, p = 0.087*). Previous research has shown CUI as a key factor in long-term digital inclusion (Basri et al., 2021; Elangovan & Babu, 2024; Özbek, 2025). In the Afghanistan context, one plausible factor could be FinTech providers' lack of digital familiarity and ineffective long-term engagement strategy. Despite theoretical expectations, a lack of continuous user education, poor service follow-up, and contextual constraints such as rural-urban divisions and gender barriers may limit the impact of continuous use in fostering deeper inclusion (Lakshmanan & Shanmugavel, 2025; Bacha et al., 2025).

PRS significantly moderated the association between FinTech use and FI (*β = 0.165, p = 0.001*), supporting Hypothesis 7. This research emphasizes the importance of institutional trust and supportive regulatory frameworks in promoting FinTech-driven inclusivity. Prior research has shown that regulatory clarity, digital ID infrastructure, simplified compliance, and consumer protection all improve user trust and usage (Chen et al., 2021; Osman et al., 2021; Sharma et al., 2023). In Afghanistan, the lack of strong regulatory systems has historically affected financial trust, and the positive impact of PRS in this study implies that people are more inclined to interact with FinTech when they perceive support from the government or regulatory transparency. These findings are consistent with global research from Jordan, Sub-Saharan Africa, and Islamic finance contexts, where robust regulatory systems have a direct impact on inclusion outcomes.

Overall, the study supports the role of technology perceptions (PEOU, SRQ, PES), behavioral enablers (trust), and institutional support (PRS) in promoting FinTech adoption and improving FI among SMEs. While continuous usage intention did not significantly moderate the FinTech-FI relationship, this finding highlights the necessity for ongoing engagement strategy and ecosystem improvement. These findings have important implications for policymakers, FinTech developers, and financial institutions working to improve inclusive finance in volatile environments such as Afghanistan.

Conclusion, Recommendations and Future Research Directions

Conclusion

The present paper provides an in-depth investigation of the fundamental determinants impacting FinTech adoption and the subsequent impact on FI among SMEs in Afghanistan, a country characterized by economic fragility, regulatory challenges and poor digital infrastructure. The empirical findings show that PEOU, TRS, SRQ, and PES are all

important and positive predictors of FinTech adoption. These factors work together to make it easier for SMEs to engage with digital financial platforms, emphasizing the importance of technology usability and confidence in overcoming adoption barriers in emerging economies.

Importantly, the study indicates that FinTech usage considerably improves FI by providing SMEs with access to formal financial services that were previously unavailable due to infrastructure and institutional constraints. Among the moderating variables examined, PRS appears as a critical element that improves the positive association between FinTech adoption and FI, emphasizing the importance of strong, transparent, and innovation-friendly regulatory frameworks. But the moderating effect of CUI was not statistically significant, implying that, despite initial acceptance, sustaining long-term engagement remains a challenge, most likely due to remaining infrastructural limitations, digital skill gaps, and varied service quality.

This study sheds light on the complex relationship between technological, behavioral, and institutional factors of FinTech adoption in fragile environments. It emphasizes the importance of enabling settings and trust-building measures in maximizing the potential of digital financial services for SMEs, thereby promoting inclusive economic growth and financial empowerment in Afghanistan and other emerging economies.

Recommendations

In view of the findings, the following actionable solutions are offered to improve FinTech adoption and FI among Afghan SMEs:

1. **Prioritize User-Centric Design and Usability:** FinTech developers should create platforms that are intuitive and accessible to SMEs with different digital literacy levels. Simplified interfaces and streamlined processes will make onboarding easier and lessen resistance to adoption.
2. **Increase Trust by Transparency and Reliability:** Establishing trust is crucial in unstable institutional systems. To build trust among SMEs, providers should stress honest communication, enforce rigorous data privacy and protection regulations, and maintain continuous service reliability.
3. **Improve System and Service Quality:** Consistently investing in system responsiveness, operational dependability, and customer support leads to higher user satisfaction and recurrent platform use.
4. **Implement Strong Security Protocols:** FinTech platforms should properly convey their cybersecurity measures to users. Addressing concerns about fraud, data breaches, and unauthorized access is critical for lowering risk perceptions and increasing adoption.
5. **Create and Implement Clear, Consistent, and Innovation-Friendly Regulations:** Policymakers must balance consumer protection with the flexibility needed for FinTech innovation. Initiatives like digital identity programs, streamlined licensing, and regulatory sandboxes can help to drive sector growth and trust.
6. **Raising Regulatory Awareness:** Educate SMEs on the benefits of digital financial services and existing regulatory protections. Raising awareness will increase perceived regulatory support and encourage adoption.
7. **Address Barriers to Sustained Usage:** While CUI was not a significant moderator, fostering long-term engagement requires targeted strategies such as digital skills training, reliable customer support, and investments in digital infrastructure, particularly in rural and underserved areas.
8. **Foster Multi-Stakeholder Partnerships:** Encourage partnership among government agencies, FinTech firms, financial institutions, and SMEs to create an integrated ecosystem that promotes innovation, user education, and financial inclusion.

Afghanistan can accelerate the adoption of FinTech solutions among SMEs by implementing these recommendations, increasing financial access, fostering entrepreneurship, and supporting inclusive economic development in its complex socioeconomic context.

Future Research Directions

Future studies should use longitudinal research to investigate factors influencing long-term FinTech adoption. It is critical to investigate the impact of digital literacy and development of skills on adoption among various SMEs groups, taking into account gender and rural-urban differences. Additional moderators and mediators, such as social influence, perceived risk, and financial literacy, should be explored to improve adoption models in economies that are struggling. Sector-specific FinTech adoption and comparisons of regulatory frameworks in similar contexts would provide useful insights. Finally, qualitative research on the experiences of SMEs users can help us understand behavioral factors and inspire user-centered FinTech design.

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