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FinTech and Financial Inclusion in SMEs of Afghanistan: Exploring the Mediated Moderation of Digital Financial Literacy and the Moderating Influence of Continued Usage Intention and Perceived Regulatory Support

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Abstract

This study examines the effect of FinTech adoption on financial inclusion (FI) among small and medium-sized enterprises (SMEs) in Afghanistan, with a specific emphasis on the mediated moderation of digital financial literacy (DFL) and the moderating roles of continued usage intention (CUI) and perceived regulatory support (PRS). Using structural equation modeling (SEM), the results showed that FinTech use significantly increases FI (β = 0.170, p <.001). FinTech is positively influenced by perceived ease of use (PEOU), perceived security (PES), trust (TRS), and service quality (SRQ). FinTech use strongly predicts DFL (β = 0.483, p <.001), which positively effects FI (β = 0.215, p <.001), confirming a partial mediation effect (indirect β = 0.104, p <.001). The moderation study indicates that CUI considerably enhances the relationship between DFL and FI (β = 0.190, p <.001), on the other hand, PRS does not significantly moderate the FinTech and FI relationship (β = 0.082, p =.070). The model has moderate to strong explanatory power, with R^2 values of 0.233 for DFL, 0.452 for FI, and 0.379 for FinTech use. All endogenous constructs had Q^2 values greater than 0.25, which supports predictive validity. These findings emphasize the importance of DFL and user engagement in altering FinTech adoption into meaningful financial outcomes for SMEs in weak economies. These findings can help FinTech developers, financial institutions, and policymakers design targeted strategies that improve SMEs' access to financial services, promote long-term FinTech use, and foster a more inclusive digital financial ecosystem in fragile contexts such as Afghanistan.

Keywords: FinTech adoption, Financial inclusion, SMEs, Digital financial literacy, Moderated mediation

Introduction

Financial exclusion remains an ongoing global issue that restricts equal economic development, despite significant improvements in financial infrastructure and innovation. A significant portion of the world's population, mostly in fragile and developing nations, is excluded from official financial systems, limiting their capacity to save, invest, or obtain credit (Senyo & Osabutey, 2020). The World Bank's 2021 Global Findex report highlighted the disproportionate constraints encountered by excluded groups, emphasizing the importance of innovative, scalable solutions to bridge the financial divide (Demirgüç-Kunt et al., 2022). In this context, FinTech has emerged as a revolutionary and transformative approach for providing financial services to previously ignored communities. FinTech reduces reliance on physical banking infrastructure through digital channels, particularly mobile platforms, allowing users to access, transfer, and manage finances in a more efficient and effectively manner.

The availability of FinTech, however, does not guarantee its success or influence. Its effectiveness is directly related to the ability of users to engage with digital financial tools. While FinTech provides low-cost and scalable solutions (Shaikh et al., 2023), these advantages can

only be achieved when users have the necessary digital skills. DFL plays an important role here. Unlike conventional financial literacy, DFL refers to the cognitive and technological abilities needed to comprehend, analyze, and effectively use digital financial services (Prete, 2022; Morgan et al., 2020). Even financially literate people may struggle with utilizing FinTech platforms if they lack fundamental digital abilities (Kakinuma, 2022). A lack of DFL not only limits adoption, but also raises risk exposure to online fraud, privacy violations, and incorrect usage of financial goods (Jangir et al., 2022; Ravikumar et al., 2022).

FinTech's potential for addressing financial gaps in uncertain and conflict-affected situations, such as Afghanistan, is largely unexplored. Afghanistan's SMEs, which form the backbone of the national economy, face numerous barriers to FI, including low financial literacy, widespread informality, and limited access to financing (Da Afghanistan Bank, 2020). In 2018, SMEs loans accounted for only 0.17% of GDP, with over half of Afghan enterprises seeing access to finance as a major hurdle. In contrast, approximately 45% of businesses reported having no need for loans, indicating a gap caused by mistrust, a lack of information, or misperceptions about formal financing choices. Most MSMEs continue to rely on internal financing due to strict collateral requirements, inadequate regulatory frameworks, and banking institutions' limited reach (Zahidi & Khan, 2019; Mohammady & Vepa, 2025).

Furthermore, the regulatory environment in Afghanistan limits the development of digital financial services (DFS). The lack of core infrastructure, such as electronic Know Your Customer (e-KYC) protocols, real-time credit information systems, and strong consumer protection regulations, weakens user trust and suppresses innovation. Only 11% of Afghan people reported using digital payments, showing a modest adoption rate throughout the population (Da Afghanistan Bank, 2020; Samandar, 2025). These systemic challenges are worsened by long-standing gender disparities, urban-rural digital divides, and seriously low levels of digital literacy, particularly among female entrepreneurs (Shaikhzada et al., 2025; Azimi, 2025).

Against this backdrop, the current study makes a multifaceted contribution to the discussion of FinTech adoption and behavioral finance. First, it contributes to the literature by investigating the intermediary role of DFL in the relationship between FinTech use and FI. Second, it incorporates CUI's moderating role, pointing out the importance of ongoing engagement in achieving the full potential of FinTech solutions. Third, the study investigates the moderating effect of PRS, arguing that users' trust in government regulation has an important effect on both initial adoption and long-term use of FinTech solutions. Together, these analytical layers aim to provide extensive and policy-relevant understanding of how FinTech might significantly improve FI among Afghanistan SMEs, with strategic implications for stakeholders operating in similarly challenging environments.

Objectives of the study

To investigate the impact of FinTech use on FI among SMEs.

To examine the influence of PEOU on FinTech use in SMEs.

To assess how PES affects the adoption and use of FinTech.

To determine the role of TRS in promoting FinTech use among SMEs.

To evaluate the effect of FinTech use on enhancing DFL in SMEs.

To explore the relationship between DFL and FI among SMEs.

To analyze the moderating role of CUI in the relationship between DFL and FI.

To see whether PRS moderates the relationship between FinTech use and FI.

To investigate the effect of SRQ on FinTech use among SMEs.

Literature review

Theoretical Foundation

This research is underpinned by various interconnected theories that explain FinTech adoption and its impact on financial inclusion. The Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) enable us understand how perceived ease of use, trust, security, and service quality influence FinTech adoption. UTAUT also considers that perceived regulatory support plays an important role in promoting technology adoption.

According to the Resource-Based View (RBV) (Barney, 1991), digital financial literacy and continued usage intention constitute essential user resources that help in the integration of FinTech use into financial inclusion. Expectation Confirmation Theory (ECT) (Oliver, 1980) outlines how positive user experiences lead to continued usage, hence increasing the inclusion impact. Perceived Risk Theory (Featherman & Pavlou, 2003) supports the inclusion of trust and security because they minimize users' perceived risk in digital finance.

Finally, Capability Theory (Sen, 1999) and Financial Literacy Theory (Huston, 2010) highlight the mediation role of digital financial literacy, illustrating that users must have both digital and financial abilities in order to benefit from FinTech services. Together, these theories form a solid foundation for the suggested model.

FinTech and Financial Inclusion

FinTech has been viewed as a critical driver of FI, especially for emerging and neglected areas. Digital financial services such as mobile money,

digital credit, and payment platforms increase access for unbanked populations (Morgan, 2022; Makina, 2019; Salampasis & Mention, 2018), aided by infrastructure innovations such as digital identities and interoperable systems that decrease barriers in accordance with the SDGs (Arner et al., 2020; Zetzsche, Buckley, & Arner, 2019). In India, mobile wallets and peer-to-peer lending greatly improve rural financial access.

FinTech strengthens credit availability by addressing riskier borrowers with alternative data, leading to more inclusive lending (Jagtiani & Lemieux, 2017; Rosyadah et al., 2021; Umar et al., 2025). It also decreases transaction costs and increases accessibility, yet regulatory quality, infrastructure, and trust mitigate these effects (Lai et al., 2022; Ozili, 2018; Rahman & Das, 2022). Regional evidence from Sub-Saharan Africa and South Asia affirms these benefits, with an emphasis on supportive policies (Mohamed & Otake, 2025; Zins & Weill, 2016).

According to research, FinTech adoption among SMEs has positive effects on financial behavior, entrepreneurship, and economic inclusion (Anggara & Nuraeni, 2025; Omowole et al., 2024; Risman et al., 2022), as well as banking competition and market dynamics (Aleemi, Javaid, & Hafeez, 2023). Addressing digital literacy and advocating multi-stakeholder collaboration are critical for fully realizing FinTech's inclusive potential and reducing social inequalities (Cosma & Rimo, 2023; Danladi et al., 2023).

H1: FinTech use has a positive influence on FI in SMEs.

Perceived ease of use

PEOU is a critical factor of FinTech adoption, especially for SMEs with limited digital literacy and time. The empirical evidence indicates when users perceive a system as simple 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, together with usefulness and support mechanisms, was determined to be critical for technology adoption among SMEs (Nugraha et al., 2022). PEOU affected trust, reuse intention, and behavior in Islamic FinTech (Mahmoud et al., 2025) as well as broader contexts such as QRIS and P2P lending. Several research have found that PEOU often exerts more influence than perceived usefulness or even functions independently of it (Efendi et al., 2024; Lusiana et al., 2025). In digital payment and e-money systems, ease of use has been associated with behavioral intention, enjoyment, and satisfaction, especially when combined with trust and literacy (Jasin, 2022; Kurniasari & Abd Hamid, 2020; Ikwanto & Indriani, 2024; Rahmawati & Merlinda, 2024). Usability is thus crucial across systems and regions (Edo et al., 2024).

H2: PEOU positively influences FINT use

Perceived Security

Perceived security continuously plays a significant part in FinTech adoption, increasing trust, satisfaction, and behavioral intention across multiple platforms. In peer-to-peer lending and mobile payments, security fosters confidence and shapes user intents (Utami & Soesetyo,

2023; Najib et al., 2021). Similar mechanisms have been identified in e-wallet and mobile wallet usage, where security—via trust—drives adoption (Zena & Susanto, 2022; Salah & Ayyash, 2024; Sa'diyah & Soegoto, 2021). Structural modeling proves this pattern in mobile banking and wallets, with security both directly and indirectly encouraging usage. Numerous researches conducted in Indonesia, China, Bangladesh, and rural Pakistan support perceived security as a significant factor 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 indicate that secure platforms and transparent privacy measures are critical for fostering confidence and long-term FinTech adoption.

H3: PES positively influences FinTech use

Trust

Trust is a major enabler of FinTech adoption, transferring user expectations and system quality into usage behavior, especially among areas with poor digital literacy (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 concerns such as privacy and brand image all contribute to developing confidence (Singh & Sharma, 2024; Nguyen et al., 2024; Pratama, 2021; Vasquez & San-Jose, 2022; Zhang et al., 2023). Studies further indicate that trust mediates adoption in a variety of contexts, which is strengthened by trust tendency, government support, and brand credibility (Balaskas et al., 2024; Ashrafi et al., 2022; Zhao et al., 2024; Garad et al., 2025). Its significance is proved in industries such as banking, healthcare, and MSMEs (Gupta et al., 2023; Elsaman et al., 2024; Hassan et al., 2022; Noreen, 2023).

H4: TRS positively influences FinTech use.

Digital Financial Literacy

DFL is a major enabler of FinTech use and FI, particularly among SMEs. Evidence indicates that FinTech adoption improves users' digital financial abilities, hence improving access to financial services (Amnas et al., 2024; Easter et al., 2024; Kulshrestha, 2023; Widiyatmoko et al., 2024). Studies confirm a sequential path where FinTech use increases DFL, eventually promoting inclusion, with this mediation evident in diverse contexts such as Pakistan, Indonesia, and Bosnia (Zaimovic et al., 2025; Hasan et al., 2024; Ur Rehman et al., 2023; Lontchi et al., 2023; Khan et al., 2024; Bakashaba et al., 2024; Al-Shami et al., 2024).

Beyond inclusiveness, DFL encourages sustainable development and SMEs success by enabling users to efficiently navigate digital platforms (Basar et al., 2024; Normawati et al., 2025; Jose & Ghosh, 2025; Musa et al., 2025; Joy et al., 2025). Programs that increase digital and financial education in emerging nations are improving entrepreneurs' financial well-being and operational capacity (Tulcanaza-Prieto et al., 2025; Pelkova et al., 2023). Overall, the literature clearly supports DFL's dual role as a result of FinTech engagement and a significant predictor

of inclusive financial ecosystems.

H5: DFL positively influences FI.

Continued usage intention

CUI is essential for ensuring the long-term benefits of digital financial instruments on FI, particularly among users with diverse DFL levels. Research indicates that initial FinTech acceptance is essential, but habitual use based on trust, perceived usefulness, satisfaction, and user-centric design promotes deeper inclusion (Elangovan & Babu, 2024; Basri et al., 2021; Gui et al., 2024; Amelia et al., 2024; Özbek, 2025). These aspects are critical for people with inadequate digital or financial literacy.

Studies have found perceived value, trust, and performance expectancy as key mediators affecting CUI, with benefits such as ease and security encouraging long-term use (Rizvee et al., 2025; Le et al., 2020; Mushtaq, 2024; Nguyen & Dao, 2024; Mandari & Koloseni, 2025). Theoretical models such as UTAUT and Expectation Confirmation indicate that satisfaction, habit, and social influence are predictors of continuing 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 essential for engaging underserved users and microenterprises.

Gender, age, and rural-urban divisions are contextual and demographic factors that influence the growth of CUI, with rural incentives and habitual behaviors impacting participation patterns. When coupled with trust-based service models, DFL strengthens the positive impact of CUI on inclusion (Pal et al., 2020; Putritama, 2019). Overall, evidence confirms that CUI increases DFL's effect on inclusion by encouraging constant FinTech use.

H7: CUI moderates the relationship between DFL and FI.

Perceived Regulatory support

PRS is critical for FinTech adoption and FI because it promotes trust, transparency, and enabling environments. According to research, government-backed financial literacy initiatives and clear regulatory reforms improve FinTech access, especially among youth and underserved groups (Noreen et al., 2022; Jabbar et al., 2019; Muneeza & Mustapha, 2021; Wulandari & Kassim, 2016), with culturally aligned frameworks improving confidence in Islamic finance.

Regulatory clarity and supportive infrastructure turn FinTech availability into usage. Adoption can be encouraged by digital ID programs, simplified licensing, and transparent rules (Sharma et al., 2023; Demirgüç-Kunt et al., 2022), while regulatory flexibility, such as sandboxes, encourages confidence and decreases barriers (Arner et al., 2016; Ozili, 2018). Studies have associated PRS to increased 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 for SMEs and marginalized groups.

Effective regulation reduces the potential risks of early adoption while fostering steady inclusion (Chinoda & Kapingura, 2024; Gichuru & Namada, 2022). Collaborative regulatory frameworks achieve a balance between innovation and protection while increasing inclusion (Vijayagopal et al., 2024; Abaidoo & Agyapong, 2024). Higher regulatory quality is associated with higher FinTech use and financial account ownership, as shown by Jordan and cross-national research (Al-afeef et al., 2024; Chen & Divanbeigi, 2019). Overall, PRS supports inclusive financial ecosystems by increasing trust, lowering obstacles, and promoting safe, efficient services.

H8: PRS moderates the relationship between FinTech use and FI.

Service Quality

SRQ is a major driver of FinTech adoption and satisfaction in frameworks such as SERVQUAL, TAM, and UTAUT2 (Sharma et al., 2023, 2024; Chand et al., 2025). Dimensions such as reliability, responsiveness, and tangibles promote perceived ease of use and usefulness, which directly influences behavioral intention. High SRQ additionally minimizes ambiguity and builds trust, encouraging long-term use (Ryu & Ko, 2020; Alwi et al., 2019). Evidence from India, Pakistan, Malaysia, and Ethiopia indicates its impact on satisfaction, adoption, and e-loyalty, especially through user-friendly interfaces and timely service (Verma, 2023; Jerene & Sharma, 2020). As a result, SRQ continues to be critical to increasing worldwide FinTech engagement.

H9: SRQ positively influence FinTech use.

Conceptual Framework

The conceptual framework shows how multiple factors influence FI through the use of FinTech services. It suggests that PEOU, PES, TRS, and SEQ are significant drivers of FinTech adoption among individuals. Once people begin using FinTech, their degree of DFL plays a mediating role in improving FI, which implies that more digitally literate users can better capitalize on FinTech for financial access. The model additionally suggests that PRS improves the association between FinTech usage and DFL, indicating that supportive policies and oversight support users to become more technologically adept. Furthermore, CUI affects the influence of DFL on FI, stressing that sustained engagement with FinTech platforms increases the benefits of being digitally literate in achieving FI.

Financial exclusion remains an ongoing global issue that restricts equal economic development, despite significant improvements in financial infrastructure and innovation. A significant portion of the world's population, mostly in fragile and developing nations, is excluded from official financial systems, limiting their capacity to save, invest, or obtain credit (Senyo & Osabutey, 2020). The World

Bank's 2021 Global Findex report highlighted the disproportionate constraints encountered by excluded groups, emphasizing the importance of innovative, scalable solutions to bridge the financial divide (Demirgüç-Kunt et al., 2022). In this context, FinTech has emerged as a revolutionary and transformative approach for providing financial services to previously ignored communities. FinTech reduces reliance on physical banking infrastructure through digital channels, particularly mobile platforms, allowing users to access, transfer, and manage finances in a more efficient and effectively manner.

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FinTech's potential for addressing financial gaps in uncertain and conflict-affected situations, such as Afghanistan, is largely unexplored. Afghanistan's SMEs, which form the backbone of the national economy, face numerous barriers to FI, including low financial literacy, widespread informality, and limited access to financing (Da Afghanistan Bank, 2020). In 2018, SMEs loans accounted for only 0.17% of GDP, with over half of Afghan enterprises seeing access to finance as a major hurdle. In contrast, approximately 45% of businesses reported having no need for loans, indicating a gap caused by mistrust, a lack of information, or misperceptions about formal financing choices. Most MSMEs continue to rely on internal financing due to strict collateral requirements, inadequate regulatory frameworks, and banking institutions' limited reach (Zahidi & Khan, 2019; Mohammady & Vepa, 2025).

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- To assess how PES affects the adoption and use of FinTech.
- To determine the role of TRS in promoting FinTech use among SMEs.
- To evaluate the effect of FinTech use on enhancing DFL in SMEs.
- To explore the relationship between DFL and FI among SMEs.
- To analyze the moderating role of CUI in the relationship between DFL and FI.
- To see whether PRS moderates the relationship between FinTech use and FI.

- To investigate the effect of SRQ on FinTech use among SMEs.

Literature review

Theoretical Foundation

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Finally, Capability Theory (Sen, 1999) and Financial Literacy Theory (Huston, 2010) highlight the mediation role of digital financial literacy, illustrating that users must have both digital and financial abilities in order to benefit from FinTech services. Together, these theories form a solid foundation for the suggested model.

FinTech and Financial Inclusion

FinTech has been viewed as a critical driver of FI, especially for emerging and neglected areas. Digital financial services such as mobile money, digital credit, and payment platforms increase access for unbanked populations (Morgan, 2022; Makina, 2019; Salampasis & Mention, 2018), aided by infrastructure innovations such as digital identities and interoperable systems that decrease barriers in accordance with the SDGs (Arner et al., 2020; Zetzsche, Buckley, & Arner, 2019). In India, mobile wallets and peer-to-peer lending greatly improve rural financial access.

FinTech strengthens credit availability by addressing riskier borrowers with alternative data, leading to more inclusive lending (Jagtiani & Lemieux, 2017; Rosyadah et al., 2021; Umar et al., 2025). It also decreases transaction costs and increases accessibility, yet regulatory quality, infrastructure, and trust mitigate these effects (Lai et al., 2022; Ozili, 2018; Rahman & Das, 2022). Regional evidence from Sub-Saharan Africa and South Asia affirms these benefits, with an emphasis on supportive policies (Mohamed & Otake, 2025; Zins & Weill, 2016).

According to research, FinTech adoption among SMEs has positive effects on financial behavior, entrepreneurship, and economic inclusion (Anggara & Nuraeni, 2025; Omowole et al., 2024; Risman et al., 2022), as well as banking competition and market dynamics (Aleemi, Javaid, & Hafeez, 2023). Addressing digital literacy and advocating multi-stakeholder collaboration are critical for fully realizing FinTech's inclusive potential and reducing social inequalities (Cosma & Rimo, 2023; Danladi et al., 2023).

H1: FinTech use has a positive influence on FI in SMEs.

Perceived ease of use

PEOU is a critical factor of FinTech adoption, especially for SMEs with limited digital literacy and time. The empirical evidence indicates when users perceive a system as simple 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, together with usefulness and support mechanisms, was determined to be critical for technology adoption among SMEs (Nugraha et al., 2022). PEOU affected trust, reuse intention, and behavior in Islamic FinTech (Mahmoud et al., 2025) as well as broader contexts such as QRIS and P2P lending. Several research have found that PEOU often exerts more influence than perceived usefulness or even functions independently of it (Efendi et al., 2024; Lusiana et al., 2025). In digital payment and e-money systems, ease of use has been associated with behavioral intention, enjoyment, and satisfaction, especially when combined with trust and literacy (Jasin, 2022; Kurniasari & Abd Hamid, 2020; Ikwanto & Indriani, 2024; Rahmawati & Merlinda, 2024). Usability is thus crucial across systems and regions (Edo et al., 2024).

H2: PEOU positively influences FINT use

Perceived Security

Perceived security continuously plays a significant part in FinTech adoption, increasing trust, satisfaction, and behavioral intention across multiple platforms. In peer-to-peer lending and mobile payments, security fosters confidence and shapes user intents (Utami & Soesetyo, 2023; Najib et al., 2021). Similar mechanisms have been identified in e-wallet and mobile wallet usage, where security—via trust—drives adoption (Zena & Susanto, 2022; Salah & Ayyash, 2024; Sa'diyah & Soegoto, 2021). Structural modeling proves this pattern in mobile banking and wallets, with security both directly and indirectly encouraging usage. Numerous researches conducted in Indonesia, China, Bangladesh, and rural Pakistan support perceived security as a significant factor 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 indicate that secure platforms and transparent privacy measures are critical for fostering confidence and long-term FinTech adoption.

H3: PES positively influences FinTech use

Trust

Trust is a major enabler of FinTech adoption, transferring user expectations and system quality into usage behavior, especially among areas with poor digital literacy (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 concerns such as privacy and brand image all contribute to developing confidence (Singh & Sharma, 2024; Nguyen et al., 2024; Pratama, 2021; Vasquez & San-Jose, 2022; Zhang et al., 2023). Studies further indicate that trust mediates adoption in a variety of contexts, which is strengthened by trust tendency, government support, and brand credibility (Balaskas et al., 2024; Ashrafi et al., 2022; Zhao et al., 2024; Garad et al., 2025). Its significance is proved in industries such as banking, healthcare, and MSMEs (Gupta et al., 2023; Elsaman et al., 2024; Hassan et al., 2022; Noreen, 2023).

H4: TRS positively influences FinTech use.

Digital Financial Literacy

DFL is a major enabler of FinTech use and FI, particularly among SMEs. Evidence indicates that FinTech adoption improves users' digital financial abilities, hence improving access to financial services (Amnas et al., 2024; Easter et al., 2024; Kulshrestha, 2023; Widiyatmoko et al., 2024). Studies confirm a sequential path where FinTech use increases DFL, eventually promoting inclusion, with this mediation evident in diverse contexts such as Pakistan, Indonesia, and Bosnia (Zaimovic et al., 2025; Hasan et al., 2024; Ur Rehman et al., 2023; Lontchi et al., 2023; Khan et al., 2024; Bakashaba et al., 2024; Al-Shami et al., 2024). Beyond inclusiveness, DFL encourages sustainable development and SMEs success by enabling users to efficiently navigate digital platforms (Basar et al., 2024; Normawati et al., 2025; Jose & Ghosh, 2025; Musa et al., 2025; Joy et al., 2025). Programs that increase digital and financial education in emerging nations are improving entrepreneurs' financial well-being and operational capacity (Tulcanaza-Prieto et al., 2025; Pelkova et al., 2023). Overall, the literature clearly supports DFL's dual role as a result of FinTech engagement and a significant predictor of inclusive financial ecosystems.

H5: DFL positively influences FI.

Continued usage intention

CUI is essential for ensuring the long-term benefits of digital financial instruments on FI, particularly among users with diverse DFL levels. Research indicates that initial FinTech acceptance is essential, but habitual use based on trust, perceived usefulness, satisfaction, and user-centric design promotes deeper inclusion (Elangovan & Babu, 2024; Basri et al., 2021; Gui et al., 2024; Amelia et al., 2024; Özbek, 2025). These aspects are critical for people with inadequate digital or financial literacy.

Studies have found perceived value, trust, and performance expectancy as key mediators affecting CUI, with benefits such as ease and security encouraging long-term use (Rizvee et al., 2025; Le et al., 2020; Mushtaq, 2024; Nguyen & Dao, 2024; Mandari & Koloseni, 2025). Theoretical models such as UTAUT and Expectation Confirmation indicate that satisfaction, habit, and social influence are predictors of continuing 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 essential for engaging underserved users and microenterprises.

Gender, age, and rural-urban divisions are contextual and demographic factors that influence the growth of CUI, with rural incentives and habitual behaviors impacting participation patterns. When coupled with trust-based service models, DFL strengthens the positive impact of CUI on inclusion (Pal et al., 2020; Putritama, 2019). Overall, evidence confirms that CUI increases DFL's effect on inclusion by encouraging constant FinTech use.

H7: CUI moderates the relationship between DFL and FI.

Perceived Regulatory support

PRS is critical for FinTech adoption and FI because it promotes trust, transparency, and enabling environments. According to research, government-backed financial literacy initiatives and clear regulatory reforms improve FinTech access, especially among youth and underserved groups (Noreen et al., 2022; Jabbar et al., 2019; Muneeza & Mustapha, 2021; Wulandari & Kassim, 2016), with culturally aligned frameworks improving confidence in Islamic finance. Regulatory clarity and supportive infrastructure turn FinTech availability into usage. Adoption can be encouraged by digital ID programs, simplified licensing, and transparent rules (Sharma et al., 2023; Demirgüç-Kunt et al., 2022), while regulatory flexibility, such as sandboxes, encourages confidence and decreases barriers (Arner et al., 2016; Ozili, 2018). Studies have associated PRS to increased 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 for SMEs and marginalized groups.

Effective regulation reduces the potential risks of early adoption while fostering steady inclusion (Chinoda & Kapingura, 2024; Gichuru & Namada, 2022). Collaborative regulatory frameworks achieve a balance between innovation and protection while increasing inclusion (Vijayagopal et al., 2024; Abaidoo & Agyapong, 2024). Higher regulatory quality is associated with higher FinTech use and financial account ownership, as shown by Jordan and cross-national research (Al-afeef et al., 2024; Chen & Divanbeigi, 2019). Overall, PRS

supports inclusive financial ecosystems by increasing trust, lowering obstacles, and promoting safe, efficient services.

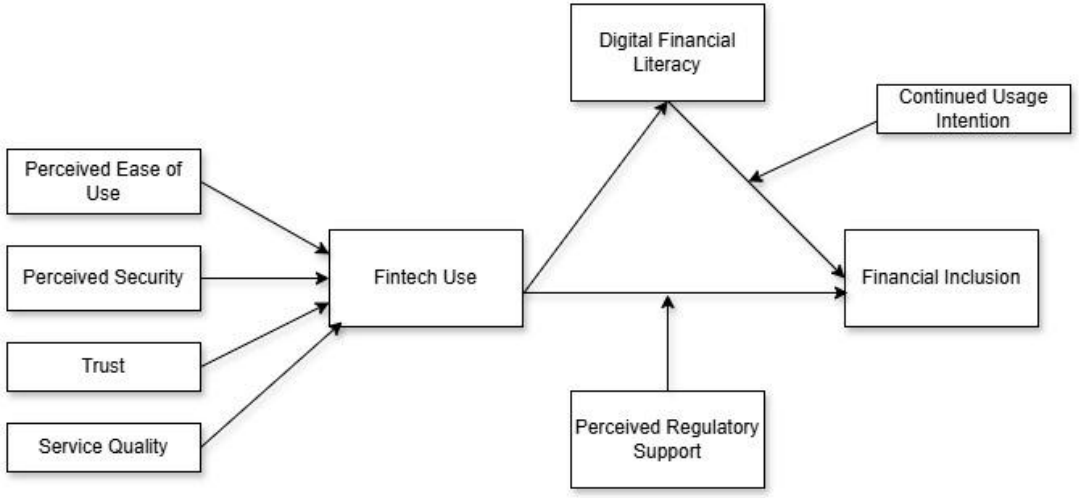
H8: PRS moderates the relationship between FinTech use and FI.

Service Quality

SRQ is a major driver of FinTech adoption and satisfaction in frameworks such as SERVQUAL, TAM, and UTAUT2 (Sharma et al., 2023, 2024; Chand et al., 2025). Dimensions such as reliability, responsiveness, and tangibles promote perceived ease of use and usefulness, which directly influences behavioral intention. High SRQ additionally minimizes ambiguity and builds trust, encouraging long-term use (Ryu & Ko, 2020; Alwi et al., 2019). Evidence from India, Pakistan, Malaysia, and Ethiopia indicates its impact on satisfaction, adoption, and e-loyalty, especially through user-friendly interfaces and timely service (Verma, 2023; Jerene & Sharma, 2020). As a result, SRQ continues to be critical to increasing worldwide FinTech engagement.

H9: SRQ positively influence FinTech use.

Conceptual Framework



The conceptual framework shows how multiple factors influence FI through the use of FinTech services. It suggests that PEOU, PES, TRS, and SEQ are significant drivers of FinTech adoption among individuals. Once people begin using FinTech, their degree of DFL plays a mediating role in improving FI, which implies that more digitally literate users can better capitalize on FinTech for financial access. The model additionally suggests that PRS improves the association between FinTech usage and DFL, indicating that supportive policies and oversight support users to become more technologically adept. Furthermore, CUI affects the influence of DFL on FI, stressing that sustained engagement with FinTech platforms increases the benefits of being digitally literate in achieving FI.

Research Methodology

Research philosophy and paradigm

The study is based on a positivist research paradigm that prioritizes empirical testing, objective measurement, and hypothesis-driven investigation. This philosophical view is consistent with the study's focus on quantitative constructs like FinTech adoption, DFL, CUI, and PRS. Using validated questionnaires, the research aims to provide generalizable and replicable results that contribute to a better understanding of FinTech's impact in the context of Afghanistan's financial ecosystem. The positivist perspective encourages methodical investigations of cause-and-effect relationships, which are critical for shaping FinTech policy and practice.

Research approach and Design

This research utilizes a deductive approach, beginning with the development of hypotheses based on existing theoretical models and previous empirical studies. These hypotheses are investigated by collecting and analyzing primary data from Afghan small and medium-sized enterprises. Given the constraints of time and accessibility, a cross-sectional design was selected, which allows data to be collected at just one point in time. Although this reduces the ability to infer causality, it is suitable for discovering relationships and trends between variables. PLS-SEM was chosen as the primary analytical technique because of its robustness in dealing with small to medium sample sizes, tolerance for non-normal data distributions, and ability to examine mediation and moderation effects simultaneously. The approach maintains scientific rigor while accounting for the contextual limits of data gathering in Afghanistan.

Population and sampling

This study's target population consists of Afghan SME owners and managers who actively utilize or have expertise with FinTech services. Due to the specialized nature of the topic, purposive sampling was used to guarantee that participants had relevant knowledge and experience with digital financial systems. This method improves the relevance and validity of the information gathered. The optimal sample size was determined using G*Power analysis, which showed that a minimum of 160 responses would be required to detect medium effect sizes with a statistical power of 95%. This sampling technique assures both feasibility and analytical adequacy, balancing rigor with the practical limitations of carrying out research in a post-conflict environment.

Construct measurement, Indictors, and Sources

The study used a number of validated measurement of constructs, each tested using several items derived from known sources. PEOU was assessed based on Davis's work (1989). TR was based on Singh and Srivastava (2018), Kumar et al. (2018), and Chandra et al. (2010). SQ was measured using data from Zhou (2013). Swilley (2010) proposed an assessment method for PS. CUI was obtained from Venkatesh et al. (2012) and Kumar et al. (2018), whereas FinTech Use was taken from Venkatesh et al. (2012). FI was adapted from Bongomin and Ntayi (2020), while DFL was based on Ravikumar et al. (2022). Finally, PRS was analyzed using Chandra et al. (2010).

Research instrument

Data was collected using a structured questionnaire tailored to assess the study's major constructs, which included FinTech use, DFL, PRS, and CUI. Each cosntruct was operationalized using numerous items assessed on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." The questionnaire was developed from previously tested measures to ensure content validity. Prior to the major data collection, a pilot test with 30 SME respondents was carried out to evaluate the items' clarity, reliability, and cultural relevance. The pilot's feedback resulted in minor adjustments that improved the instrument's overall validity and usefulness.

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 obtained using SPSS to summarize respondent characteristics and provide an overview of the data. Cronbach's Alpha and AVE were used to assess reliability and convergent validity. SmartPLS 4 was used to conduct SEM on the suggested relationships, with an emphasis on DFL's mediation role and PRS and CUI's moderating roles. Bootstrapping with 5,000 subsamples was utilized to figure out the statistical significance of the model parameters.

Results and Analysis

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%
	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%

Demographics	Categories	Frequency	Percentage
	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%

Demographics	Categories	Frequency	Percentage
	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

A total of 600 SMEs participants from various regions of Afghanistan contributed to the study that addressed the relationship between FinTech adoption and FI. The sample was mostly male (n = 558, 93%), reflecting the male-dominated SMEs context in Afghanistan, with only 7% (n = 42) being female. The majority of respondents (n = 294, 49%) were 35-44 years old, followed by those aged 25-34 (n = 135, 22.5%) and 45-54 (n = 129, 21.5%), indicating a higher percentage of middle-aged participation in SME leadership and FinTech adoption. In terms of their education, 53% (n = 318) had secondary school certificates, 26% (n = 156) held bachelor's degrees, and 9.5% (n = 57) obtained master's degrees, with only 1% (n = 6) reporting no formal schooling. Service-based SMEs were the most common (n = 282, 47%), followed by manufacturing and retail (n = 90, 15%), agricultural (n = 75, 12.5%), IT/technology (n = 48, 8%), and other sectors (n = 15, 2.5%). Participants included a variety of organizational roles, including operations managers (n = 231, 38.5%), owners (n = 153, 25.5%), financial/accounting personnel (n = 87, 14.5%), IT/technical leads (n = 63, 10.5%), and others (n = 66, 11%). Most of respondents worked

in small organizations (10-49 employees; n = 345, 57.5%), followed by medium-sized firms (50-249 employees; n = 186, 31%), and micro-enterprises (1-9 employees; n = 69, 11.5%). The majority of enterprises had been in operation for 4-7 years (n = 309, 51.5%) or more (n = 201, 33.5%).

Regionally, 25% (n = 150) of respondents were from Central Afghanistan. 20% (n = 120) came from the Eastern and Northern regions, 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 improves the generalizability of the findings and contributes to the study's goal of capturing an accurate depiction of FinTech use and FI across Afghanistan's SMEs.

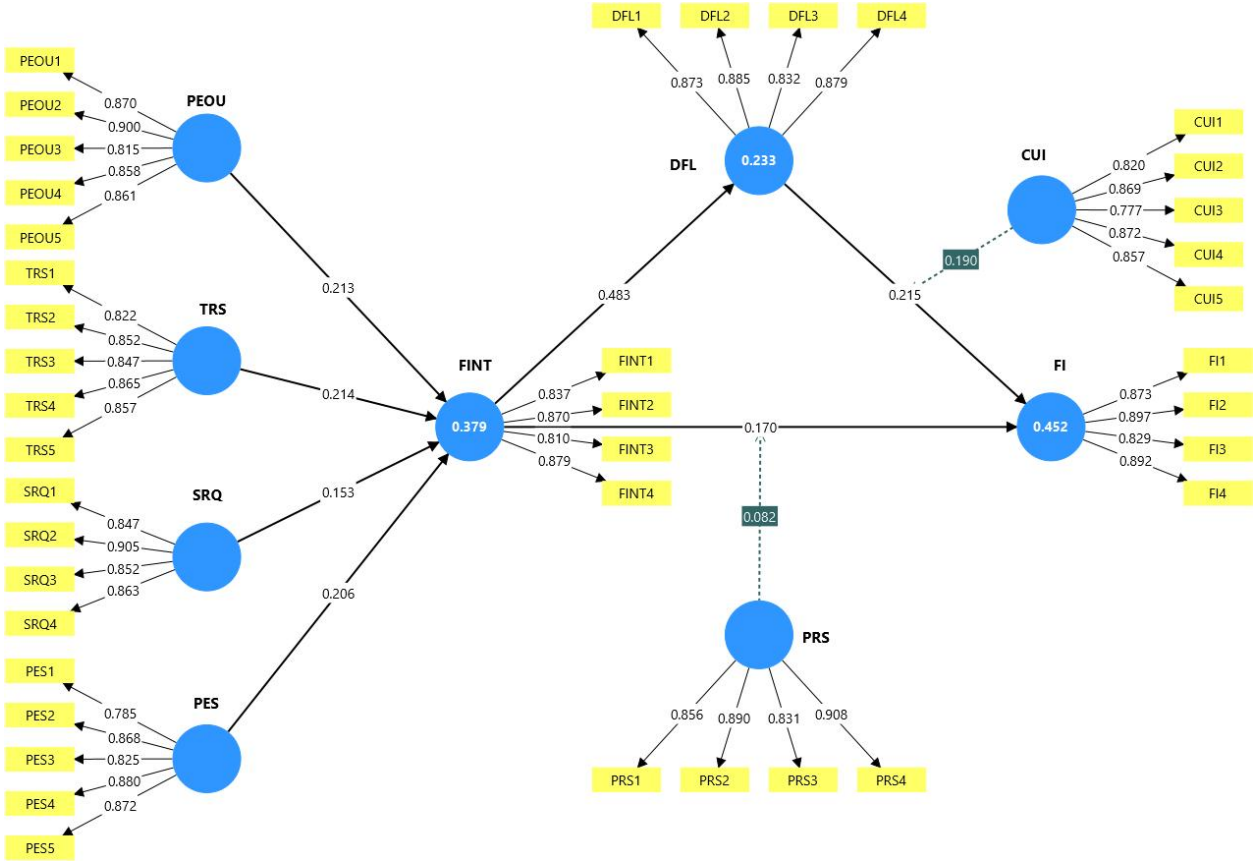
Common Method Bias Test

The overall collinearity test, as proposed by Kock (2015), was used to examine common method bias using variance inflation factor (VIF) values, with any value above the 3.3 threshold indicating potential bias. In this investigation, all outer model indicators showed VIF values ranging from 1.966 to 3.418, with only one item PEOU2 slightly above the threshold (VIF = 3.418). These slight differences, however, was not regarded to be indicating of considerable method bias because it was isolated and inconsistent throughout the model. Furthermore, the inner model VIF values ranged from 1.000 to 1.923, which is significantly below the required threshold. These findings suggest that common method bias is not a significant concern in the current study.

Measurement Model Assement

Indicator Loadings, VIF, Reliability, and Convergent Validity

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:

Constructs	Items	Cross Loadings	VIF	Alpha	Composite Reliablity	AVE
Continue Usage Intention	CUI1	0.82	2.19	0.895	0.923	0.705
	CUI2	0.869	2.919			
	CUI3	0.777	2.032			
	CUI4	0.872	2.574			

	CUI5	0.857	2.425			
Digital Financial Literacy	DFL1	0.873	2.358	0.89	0.924	0.753
	DFL2	0.885	2.768			
	DFL3	0.832	2.06			
	DFL4	0.879	2.506			
Financial Inclusion	FI1	0.873	2.354	0.897	0.928	0.763
	FI2	0.897	3.179			
	FI3	0.829	2.216			
	FI4	0.892	2.655			
FinTech	FINT1	0.837	1.966	0.872	0.912	0.721
	FINT2	0.87	2.541			
	FINT3	0.81	1.993			
	FINT4	0.879	2.392			
Perceived Ease of Use	PEOU1	0.87	2.744	0.913	0.935	0.742
	PEOU2	0.90	3.418			
	PEOU3	0.815	2.22			
	PEOU4	0.858	2.495			
	PEOU5	0.861	2.487			
Perceived Security	PES1	0.785	1.967	0.901	0.927	0.717
	PES2	0.868	2.836			
	PES3	0.825	2.283			
	PES4	0.88	2.75			
	PES5	0.872	2.67			
Perceived Regulatory Support	PRS1	0.856	2.299	0.895	0.927	0.76
	PRS2	0.89	2.972			
	PRS3	0.831	2.112			
	PRS4	0.908	2.896			
Service Quality	SRQ1	0.847	2.221	0.889	0.924	0.751
	SRQ2	0.905	3.215			

	SRQ3	0.852	2.247			
	SRQ4	0.863	2.315			
Trust	TRS1	0.822	2.123	0.903	0.928	0.72
	TRS2	0.852	2.581			
	TRS3	0.847	2.532			
	TRS4	0.865	2.532			
	TRS5	0.857	2.48			

Source: Author's Compilation

Indicator Loadings and Multicollinearity Analysis

The measurement model was assessed by analyzing indicator loadings and multicollinearity diagnostics. All indicator loadings ranged from 0.777 to 0.908, much over the recommended threshold of 0.70 (Hair et al., 2017), showing strong and consistent relationships between observable variables and their respective constructs. VIF values used to test multicollinearity ranged from 1.966 to 3.418, which is significantly lower than the traditional threshold of 5.0 (Hair et al., 2019). Although one indicator (PEOU2) only above the tighter 3.3 threshold (VIF = 3.418), the difference was minor and not considered serious (Kock, 2015). These results confirm the measuring model's reliability and discriminant clarity.

Internal Consistency Reliability Assessment

The measurement scales' reliability was evaluated using Cronbach's alpha and composite reliability (CR). All Cronbach's alpha values above the recommended threshold of 0.70, ranging from 0.872 to 0.913, suggesting good item internal consistency (Nunnally and Bernstein, 1994). Composite reliability values varied from 0.912 to 0.935, supporting scale reliability and providing a more refined assessment by taking into consideration different indicator loadings (Hair et al., 2017). The consistently high values across both metrics demonstrate the measurement devices' stability and reliability.

Convergent Validity

Convergent validity was determined using AVE values. All constructs had AVE values ranging from 0.705 to 0.763, above the minimum threshold of 0.50 (Fornell & Larcker, 1981) and approaching the higher threshold of 0.70 for established scales (Hair et al., 2017). These findings suggest that every factor explains a significant percentage of the variance in its indicators. The FI construct had the greatest AVE (0.763), and the lowest (CUI = 0.705) still exceeded the threshold, indicating good convergent validity suitable for advanced structural modeling.

Discriminant Validity Assessment

To assess discriminant validity among the latent constructs in the structural model, two generally known approaches were used: the Fornell-Larcker criterion and the Heterotrait-Monotrait Correlation Ratio (HTMT).

Table: Fornell-Larker Criterion and HTMT Rations

Construct	CUI	DFL	FI	FINT	PEOU	PES	PRS	SRQ	TRS
CUI	**0.840**	0.591	0.547	0.551	0.515	0.569	0.565	0.601	0.542
DFL	0.535	**0.868**	0.556	0.536	0.519	0.563	0.534	0.547	0.570
FI	0.503	0.506	**0.873**	0.563	0.517	0.580	0.552	0.515	0.524
FINT	0.499	0.483	0.508	**0.849**	0.530	0.550	0.543	0.498	0.544
PEOU	0.476	0.474	0.476	0.482	**0.861**	0.548	0.504	0.448	0.529
PES	0.523	0.512	0.535	0.500	0.501	**0.847**	0.556	0.577	0.551
PRS	0.519	0.483	0.506	0.492	0.461	0.510	**0.872**	0.556	0.503
SRQ	0.544	0.490	0.469	0.446	0.407	0.522	0.501	**0.867**	0.512
TRS	0.496	0.516	0.480	0.491	0.485	0.503	0.460	0.462	**0.849**

Source: Author's Compilation

Convergent and discriminant validity have been confirmed with AVE, the Fornell-Larcker criterion, and HTMT. All AVE values varied between 0.705 to 0.763, exceeding the 0.50 threshold and demonstrating strong convergent validity. Discriminant validity was confirmed

because the square root of each construct's AVE was greater than its correlations with other constructs, and all HTMT values were less than 0.85. These results validate the measurement model's convergent and discriminant validity.

Structural Model Results

The structural model evaluated the relationships between important factors associated with FinTech adoption and FI among Afghanistan's SMEs. The results supported most of the proposed hypotheses, with statistical significance at p <.05.

Table: *Hypothesis Testing Results*

Hypothesis	Path Tested	β	*t*	*P*	95% CI (LL – UL)	Result	Decision
H1: FinTech use positively influences FI in SMEs	FINT → FI	0.170	3.854	.000	[0.081, 0.255]	Sig	Yes
H2: PEOU positively influences FinTech use	PEOU → FINT	0.213	4.815	.000	[0.125, 0.298]	Sig	Yes
H3: PES positively influences FinTech use	PES → FINT	0.206	4.398	.000	[0.113, 0.297]	Sig	Yes
H4: TRS positively influences FinTech use	TRS → FINT	0.214	4.780	.000	[0.129, 0.302]	Sig	Yes
H5: FinTech use positively influences DFL (for mediation path)	FINT → DFL	0.483	15.150	.000	[0.418, 0.544]	Sig	Yes
H6: DFL positively influences FI	DFL → FI	0.215	4.273	.000	[0.114, 0.312]	Sig	Yes
H7: CUI moderates the relationship between DFL and FI	CUI × DFL → FI	0.190	5.095	.000	[0.118, 0.263]	Sig	Yes
H8: PRS moderates the relationship between FinTech use and FI	PRS × FINT → FI	0.082	1.815	.070	[-0.006, 0.169]	Not Sig	No

Hypothesis	Path Tested	β	*t*	*P*	95% CI (LL – UL)	Result	Decision
H9: SRQ positively influence FINT	SRQ → FINT	0.153	3.451	.001	[0.067, 0.238]	Sig	Yes

Source: Author's Compilation

The study found that using FinTech enhances financial inclusion for SMEs in Afghanistan (β = 0.170, p <.001), emphasizing the importance of digital services in overcoming financial barriers. PEOU has significant effects on FinTech adoption (β = 0.213, p <.001), indicating that SMEs are more inclined to use intuitive digital financial solutions. PS (β = 0.206, p <.001) and trust in FinTech providers (β = 0.214, p <.001) play significant roles in promoting adoption. FinTech use enhances DFL (β = 0.483, p <.001) and positively impacts FI (β = 0.215, p <.001). CUI moderates the relationship between DFL and FI (β = 0.190, p <.001), indicating the significance of ongoing engagement. But there was no significant moderating influence of PRS on the FinTech-FI relationships (β = 0.082, p =.070), suggesting that usability, trust, and literacy variables are more relevant in shaping FI outcomes.

Mediation

Table: Mediation (FINT→DFL→FI)

Pathway	Effect Type	B	t	p	Mediation Type
FINT → DFL → FI	Indirect Effect	0.104	4.056	.000	
FINT → FI (Direct)	Direct Effect	0.170	3.854	.000	
FINT → FI (Total)	Total Effect	0.274	5.795	.000	**Partial Mediation**

Source: Author's Compilation

A bootstrapping analysis with 5,000 resamples confirmed DFL's mediating role in the relationship between FinTech use and FI. The results showed a significant indirect effect (β = 0.104, t = 4.056, p <.001). The evidence suggests that FinTech adoption increases SMEs' digital financial competencies, resulting in better access to and use of formal financial services. As a result, DFL serves as a vital tool for increasing FI through the usage of FinTech.

Direct and Total Effects Analysis

Even after accounting for the mediating role of DFL, FinTech use retained a significant direct effect on FI (β = 0.170, t = 3.854, p <.001), showing that its influence extends beyond literacy improvements to aspects such as cost efficiency, convenience, and service access. FINT had significant impacts on FI through both direct and indirect paths (β = 0.274, t = 5.795, p <.001), highlighting FinTech's complex role.

Moderation

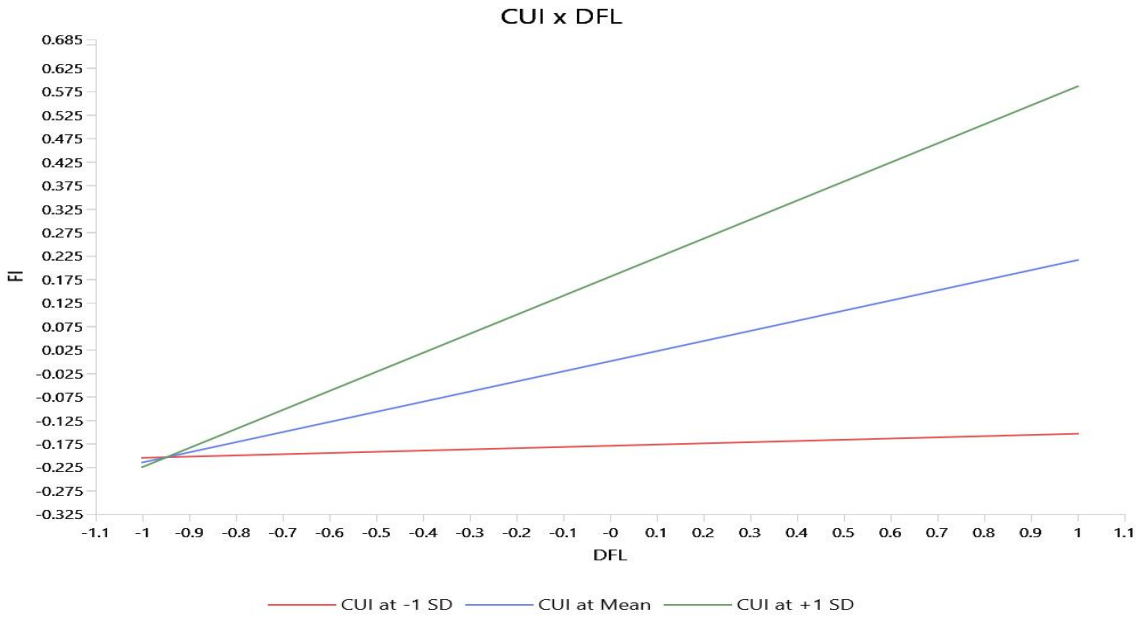
Table: Moderation Analysis

Interaction Term	Path	β	T	p	Significance	Interpretation
PRS × FINT	FI	0.082	1.815	.070	Not Significant	No moderation
CUI × DFL	FI	0.190	5.095	.000	Significant	Moderation confirmed

Source: Author's compilation

The interaction between PRS and FinTech use on FI was not statistically significant (β = 0.082, t = 1.815, p = 0.070), indicating no moderating influence. However, the interaction between CUI and DFL on FI was significant (β = 0.190, t = 5.095, p <.001), indicating that CUI moderates this relationship. This means that the influence of DFL on FI varies according to SMEs' willingness to continue using digital financial services.

Simple Slope Analysis of the Effect of CUI and DFL on FI



Source: Smartpls output

A simple slope analysis revealed that CUI moderates the relationship between DFL and FI. The effect of DFL on FI was greatest at high CUI levels, moderate at middle CUI, and weakest at low CUI, where the slope was almost flat. This pattern indicates that DFL improves FI more successfully when users are regularly engaged with digital financial tools, supporting the existence of a significant moderation influence.

Table: Explanatory power of the Structural Model

Construct	R^2	R^2 Adjusted	Interpretation
DFL	.233	.232	Small to moderate explained variance
FI	.452	.446	Moderate to large explained variance
FINT	.379	.374	Moderate explained variance

Source: Author's Compilation

The structural model had moderate to strong explanatory power (R^2 = 0.452 for FI, 0.379 for FinTech use, and 0.233 for DFL). The findings show that the model explains approximately 45% of FI variance, a moderate level for FINT, and a weaker but acceptable level for DFL, implying that other factors may possibly influence digital literacy.

Table: Predictive Validity of Structural Model

Construct	Q^2predict	RMSE	MAE	Mean Error	Error SD	Skewness
DFL	.288	0.847	0.693	.000	0.847	-0.529
FI	.397	0.779	0.598	-.067	0.776	-0.486
FINT	.368	0.798	0.607	.000	0.798	-0.474

Source: Author's Compilation

PLS-Predict revealed positive Q^2 values for FI (0.397), FinTech use (0.368), and DFL (0.288), showing strong predictive relevance. FI had the highest predictive power, as evidenced by the lowest error metrics (RMSE = 0.779; MAE = 0.598), confirming the model's accuracy and good out-of-sample prediction.

Discussion

Perceived Ease of Use

The study confirms that PEOU has a significant positive effect on FinTech adoption among SMEs (β = 0.213, p <.001), which is in line with previous research (Nugraha et al., 2022; Mahmoud et al., 2025). Several researchers emphasize the relevance of PEOU in changing

behavioral intention and usage (Purwanto et al., 2024; Nurunnisha, 2020), with similar impacts observed in QRIS and mobile payment contexts (Rahmalia et al., 2024; Ramadhani et al., 2025). PEOU, along with trust and religiosity, have been highlighted in Islamic FinTech research (Alrasyid et al., 2023; Kurniasari & Utomo, 2019), while some studies imply that financial literacy may be more influential (Hasyim et al., 2023). PEOU's influence is further enhanced by interface design and digital literacy (Edo et al., 2024; Ikwanto & Indriani, 2024). Regional evidence from Oman, Nigeria, Kenya, and Ghana reveals ease of use as an important determinant in adoption (Bhat et al., 2024; Adah et al., 2025; Coffie et al., 2021). However, contradictory findings (Silaya, 2022; Zena & Susanto, 2022) indicate that contextual modertors which include trust and support influence PEOU's effectiveness (Lestari et al., 2022; Pentury, 2023).

Perceived Security

This study reveals perceived security strongly influences FinTech use among SMEs ($\beta = 0.206$, $p < .001$), confirming with prior studies stressing security as crucial for digital adoption (Wijaya et al., 2025; Mahmoud et al., 2025). Security underlies trust, particularly in crisis situations (Nugraha et al., 2022), and is associated with regulatory compliance and digital readiness (Halawa et al., 2025). Poor infrastructure and low literacy raise security problems, but user-friendly secure platforms foster inclusion (Okoh et al., 2025; Adah et al., 2025). Security is important in all FinTech services and is especially important in Islamic banking due to ethical considerations (Mahmoud et al., 2025). It additionally improves satisfaction and retention (Rahmawati & Merlinda, 2024), with literacy and trust contributing to overcome challenges (BASAR et al., 2024; Purwanto et al., 2024). Regional studies show that security has a broad impact, influenced by socioeconomic and business traits (Karim et al., 2022; Coffie et al., 2021). While some research identifies complicated effects of perceived risk and confidence (Purwantini & Anisa, 2021; Rauf et al., 2024), trust and security remain critical to long-term adoption, though PRS has no moderating influence (Halawa et al., 2025).

Trust

This study reveals that trust strongly influences FinTech use among SMEs ($\beta = 0.214$, $p < .001$), emphasizing its crucial role in technology adoption and FI. Prior research has identified trust as a mediator between IT quality and usage (Alamoudi et al., 2025; Al-Qudah et al.,

2025) and emphasized its importance in addressing issues related to privacy and security (Shuhaiber et al., 2025). Trust lowers perceived risks (Wang et al., 2024), compensates for insufficient financial literacy (Khan et al., 2023), and is enhanced by digital literacy and regulatory support (Singh & Sharma, 2024). Trust is impacted by cultural and ethical aspects, especially in halal FinTech (Nuri, 2025), while transparency and ethical practices strengthen it (Zhang et al., 2023; Vasquez & San-Jose, 2022). Regional studies emphasize the importance of trust across sectors and in post-COVID contexts (Alhajjaj & Ahmad, 2022; Chawla et al., 2023). Overall, trust remains an important, though context-sensitive, driver of FinTech adoption and utilization.

Service Quality

This study demonstrates that perceived SRQ strongly influences FinTech use among SMEs ($\beta = 0.206$, $p < .001$), suggesting its importance in adoption and FI. According to the literature, features such as reliability, responsiveness, assurance, and empathy improve user satisfaction and increase TAM's predictive potential (Sharma et al., 2023; Aldaarmi, 2024). Culturally appropriate SRQ, particularly in Islamic contexts, increases adoption (Baber, 2019; Wibowo & Bakri, 2024), with trust mediating risk reduction (Wang & Lin, 2022). Quality features such as information security and recovery services enhance loyalty (Fan, 2024; Jerene & Sharma, 2020). Regional studies confirm the system and SRQ's impact, which is reduced by cultural and socioeconomic factors (Kim et al., 2023; Shaikh et al., 2023). Emerging AI-powered services promote SMEs growth and financial access (El-Shihy et al., 2024; Odeh et al., 2025). To maintain adoption, digital transformation and customized support are suggested (Daga et al., 2021; Utami, 2022), making SRQ critical for long-term inclusion and trust.

FINT use and FI

This study reveals that FinTech adoption significantly promotes financial inclusion among SMEs ($\beta = 0.170$, $p < .001$), enhancing global evidence of its transformative impact on marginalized businesses (Makina, 2019; Rasheed et al., 2019). FinTech tools such as mobile money and peer-to-peer lending assist in overcoming traditional challenges (Jagtiani & Lemieux, 2017), and regional studies support their

significance in enhancing MSMEs access and lowering inequality (Gupta & Sharma, 2020; Aleemi et al., 2023). Challenges such as digital illiteracy and infrastructure gaps persist (Ediagbonya & Tioluwani, 2023), as demands for further regulatory support (Ozili). Behavioral characteristics such as simplicity of use, trust, and literacy are critical for adoption (Goswami et al., 2022), and Islamic FinTech shows potential despite limited awareness (Yuneline, 2022). Addressing local challenges and promoting inclusive design and collaborations are critical for maintaining SMEs resilience and FI (Pizzi et al., 2021; Ghosh & Vinod, 2022).

DFL and FI through FINT

This analysis demonstrates that FinTech adoption positively influences FI among SMEs (β = 0.170, p <.001), with DFL playing a critical enabling role. According to research, DFL serves as both an outcome and a driver of FinTech adoption, influencing the relationships between experience, mobile money, and inclusion (Amnas et al., 2024; Zaimovic et al., 2025; Khan et al., 2024). DFL is also known to have a moderating influence on SMEs performance and inclusion quality, particularly after COVID (Okello Candiya Bongomin et al., 2025; Joy et al., 2025). DFL promotes financial empowerment for women and disabled people, but it has limitations where formal education promotes risk aversion (Hasan et al., 2023; Zhang & Fan, 2024). Cross-national evidence connects DFL to sustainable entrepreneurship and inclusive ecosystems (Basar et al., 2024; Rini & Soma, 2025).

Perceived Regulatory Support

This study showed that PRS does not significantly affect the relationship between FinTech use and FI among SMEs in Afghanistan (β = 0.082, p = 0.070), which contradicts literature that emphasizes the role of regulatory frameworks (Amnas et al., 2024; Noreen et al., 2022). While trust and ease of use greatly influence FinTech adoption in fragile environments such as Afghanistan, regulatory impact appears to be limited due to institutional capacity and enforcement constraints (Gurrea-Martinez & Remolina, 2020; Lee, 2024). Effective policy demands not only design but also implementation and community interaction (Chen & Divanbeigi, 2019). Studies that indicate significant moderation by regulation are typically conducted in countries with stronger regulatory environments (Pyoko et al., 2023; Opiyo et al.,

2024).

Continued Usage Intention

This study finds that CUI significantly moderates the relationship between DFL and FI among Afghan SMEs (β = 0.190, t = 5.095, p <.001), highlighting the significance of ongoing FinTech engagement. This validates previous research indicating that trust, satisfaction, incentives, and ease of use are critical aspects of CUI (Pal et al., 2020; Ramindran & Lee, 2024; Rizvee et al., 2025). Digital literacy, trust, and perceived value all have an effect on post-adoption behaviors. According to studies carried out in Asia and Africa, continuous use is driven by social influence, satisfaction, and task-technology fit. Trust is the most constant enabler (Gui et al., 2024; Sanchez & Tanpoco, 2023), but discontinuance is frequently caused by gaps in vendor reliability and user confidence (Sait et al., 2024).

Conclusion and Recommendations

Conclusion

This study provides strong empirical evidence for the significance of FinTech in promoting FI among Afghanistan's SMEs. The findings confirm that FinTech use significantly improves FI, both directly and indirectly through improved DFL. Key factors influencing FinTech adoption include perceived ease of use, security, trust, and service quality. Furthermore, DFL emerged as a key mediating factor, connecting FinTech adoption to increased financial access. SMEs with stronger digital financial capabilities are better positioned to use FinTech to achieve inclusive financial outcomes. Additionally, the moderation analysis showed that CUI considerably enhances the effect of DFL on FI, emphasizing the necessity of consistent engagement with digital tools. However, PRS did not significantly influence the FinTech-FI relationship, indicating that internal user considerations may be more important than external institutional support in the current Afghanistan context.

The model had moderate to great explanatory and predictive power, particularly regarding financial inclusion. Overall, the findings show the multifaceted and interactive nature of FinTech's impact on financial inclusion in fragile and developing countries, emphasizing the necessity for focused literacy and engagement initiatives to fulfill its full potential.

Recommendations

Several strategic initiatives have been proposed to increase financial inclusion among Afghanistan's SMEs. First, government agencies, non-governmental organizations (NGOs), and fintech developers should invest in DFL programs. These activities should include targeted workshops, smartphone tutorials, and local-language support to help SMEs better grasp and apply digital financial technologies. Second, FinTech providers must encourage continuous usage by creating user-friendly interfaces and customer experiences that foster long-term engagement. Incorporating features like usage reminders, loyalty rewards, and instructional nudges can dramatically increase DFL's benefits for financial inclusion.

Third, improving trust and security is vital, as these aspects heavily affect FinTech adoption. To develop user trust, providers must adopt strong cybersecurity safeguards, keep user policies transparent, and provide suitable grievance redressal channels. Fourth, simplifying the user experience is essential, especially for SMEs with limited digital literacy. To guarantee widespread acceptance, fintech applications should be easy, multilingual (particularly in Pashto and Dari), and created with accessibility in mind.

Fifth, there is a need to reconsider regulatory actions. The study discovered no significant moderating effect of perceived regulatory support, which could be attributed to insufficient awareness. Policymakers should make rules more visible, accessible, and user-friendly for SMEs, as well as conduct focused awareness initiatives. Sixth, support for inclusive innovation in unstable economies is critical. Donors and international financial institutions should prioritize investments in low-data FinTech solutions, offline capabilities, and platforms that interact with established financial systems.

Seventh, developing public-private collaboration is critical for expanding digital financial services. Coordinated initiatives by government

agencies, FinTech firms, and development groups can help scale solutions and enhance digital infrastructure, particularly in underserved rural and conflict-affected areas. Finally, future research should look into other potential moderating factors like access to infrastructure, gender dynamics, and mobile penetration. Longitudinal studies are also suggested for tracking how FinTech usage and impacts change over time.

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The study is based on a positivist research paradigm that prioritizes empirical testing, objective measurement, and hypothesis-driven investigation. This philosophical view is consistent with the study's focus on quantitative constructs like FinTech adoption, DFL, CUI, and PRS. Using validated questionnaires, the research aims to provide generalizable and replicable results that contribute to a better understanding of

FinTech's impact in the context of Afghanistan's financial ecosystem. The positivist perspective encourages methodical investigations of cause-and-effect relationships, which are critical for shaping FinTech policy and practice.

Research approach and Design

This research utilizes a deductive approach, beginning with the development of hypotheses based on existing theoretical models and previous empirical studies. These hypotheses are investigated by collecting and analyzing primary data from Afghan small and medium-sized enterprises. Given the constraints of time and accessibility, a cross-sectional design was selected, which allows data to be collected at just one point in time. Although this reduces the ability to infer causality, it is suitable for discovering relationships and trends between variables. PLS-SEM was chosen as the primary analytical technique because of its robustness in dealing with small to medium sample sizes, tolerance for non-normal data distributions, and ability to examine mediation and moderation effects simultaneously. The approach maintains scientific rigor while accounting for the contextual limits of data gathering in Afghanistan.

Population and sampling

This study's target population consists of Afghan SME owners and managers who actively utilize or have expertise with FinTech services. Due to the specialized nature of the topic, purposive sampling was used to guarantee that participants had relevant knowledge and experience with digital financial systems. This method improves the relevance and validity of the information gathered. The optimal sample size was determined using G*Power analysis, which showed that a minimum of 160 responses would be required to detect medium effect sizes with a statistical power of 95%. This sampling technique assures both feasibility and analytical adequacy, balancing rigor with the practical limitations of carrying out research in a post-conflict environment.

Construct measurement, Indictors, and Sources

The study used a number of validated measurement of constructs, each tested using several items derived from known sources. PEOU was assessed based on Davis's work (1989). TR was based on Singh and Srivastava (2018), Kumar et al. (2018), and Chandra et al. (2010). SQ was measured using data from Zhou (2013). Swilley (2010) proposed an assessment method for PS. CUI was obtained from Venkatesh et al. (2012) and Kumar et al. (2018), whereas FinTech Use was taken from Venkatesh et al. (2012). FI was adapted from Bongomin and Ntayi (2020), while DFL was based on Ravikumar et al. (2022). Finally, PRS was analyzed using Chandra et al. (2010).

Research instrument

Data was collected using a structured questionnaire tailored to assess the study's major constructs, which included FinTech use, DFL, PRS, and CUI. Each cosntruct was operationalized using numerous items assessed on a five-point Likert scale ranging from "strongly disagree" to

"strongly agree." The questionnaire was developed from previously tested measures to ensure content validity. Prior to the major data collection, a pilot test with 30 SME respondents was carried out to evaluate the items' clarity, reliability, and cultural relevance. The pilot's feedback resulted in minor adjustments that improved the instrument's overall validity and usefulness.

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 obtained using SPSS to summarize respondent characteristics and provide an overview of the data. Cronbach's Alpha and AVE were used to assess reliability and convergent validity. SmartPLS 4 was used to conduct SEM on the suggested relationships, with an emphasis on DFL's mediation role and PRS and CUI's moderating roles. Bootstrapping with 5,000 subsamples was utilized to figure out the statistical significance of the model parameters.

Results and Analysis

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%
	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

A total of 600 SMEs participants from various regions of Afghanistan contributed to the study that addressed the relationship between FinTech adoption and FI. The sample was mostly male (n = 558, 93%), reflecting the male-dominated SMEs context in Afghanistan, with only 7% (n = 42) being female. The majority of respondents (n = 294, 49%) were 35-44 years old, followed by those aged 25-34 (n = 135, 22.5%) and 45-54 (n = 129, 21.5%), indicating a higher percentage of middle-aged participation in SME leadership and FinTech adoption.

In terms of their education, 53% (n = 318) had secondary school certificates, 26% (n = 156) held bachelor's degrees, and 9.5% (n = 57) obtained master's degrees, with only 1% (n = 6) reporting no formal schooling. Service-based SMEs were the most common (n = 282, 47%), followed by manufacturing and retail (n = 90, 15%), agricultural (n = 75, 12.5%), IT/technology (n = 48, 8%), and other sectors (n = 15, 2.5%).

Participants included a variety of organizational roles, including operations managers (n = 231, 38.5%), owners (n = 153, 25.5%), financial/accounting personnel (n = 87, 14.5%), IT/technical leads (n = 63, 10.5%), and others (n = 66, 11%). Most of respondents worked in small organizations (10-49 employees; n = 345, 57.5%), followed by medium-sized firms (50-249 employees; n = 186, 31%), and micro-enterprises (1-9 employees; n = 69, 11.5%). The majority of enterprises had been in operation for 4-7 years (n = 309, 51.5%) or more (n = 201, 33.5%).

Regionally, 25% (n = 150) of respondents were from Central Afghanistan. 20% (n = 120) came from the Eastern and Northern regions, 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 improves the generalizability of the findings and contributes to the study's goal of capturing an accurate depiction of FinTech use and FI across Afghanistan's SMEs.

Common Method Bias Test

The overall collinearity test, as proposed by Kock (2015), was used to examine common method bias using variance inflation factor (VIF) values, with any value above the 3.3 threshold indicating potential bias. In this investigation, all outer model indicators showed VIF values ranging from 1.966 to 3.418, with only one item PEOU2 slightly above the threshold (VIF = 3.418). These slight differences, however, was not regarded to be indicating of considerable method bias because it was isolated and inconsistent throughout the model. Furthermore, the inner model VIF values ranged from 1.000 to 1.923, which is significantly below the required threshold. These findings suggest that common method bias is not a significant concern in the current study.

Measurement Model Assement

Indicator Loadings, VIF, Reliability, and Convergent Validity

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:

Constructs	Items	Cross Loadings	VIF	Alpha	Composite Reliablity		AVE
Continue Usage Intention	CUI1	0.82	2.19	0.895	0.923	0.705	
	CUI2	0.869	2.919				
	CUI3	0.777	2.032				
	CUI4	0.872	2.574				
	CUI5	0.857	2.425				
Digital Financial Literacy	DFL1	0.873	2.358	0.89	0.924	0.753	
	DFL2	0.885	2.768				
	DFL3	0.832	2.06				
	DFL4	0.879	2.506				
Financial Inclusion	FI1	0.873	2.354	0.897	0.928	0.763	
	FI2	0.897	3.179				
	FI3	0.829	2.216				
	FI4	0.892	2.655				
FinTech	FINT1	0.837	1.966	0.872	0.912	0.721	
	FINT2	0.87	2.541				
	FINT3	0.81	1.993				
	FINT4	0.879	2.392				
Perceived Ease of Use	PEOU1	0.87	2.744	0.913	0.935	0.742	
	PEOU2	0.90	3.418				

	PEOU3	0.815	2.22					
	PEOU4	0.858	2.495					
	PEOU5	0.861	2.487					
Perceived Security		PES1	0.785	1.967	0.901	0.927	0.717	
	PES2	0.868	2.836					
	PES3	0.825	2.283					
	PES4	0.88	2.75					
	PES5	0.872	2.67					
Perceived Regulatory Support			PRS1	0.856	2.299	0.895	0.927	0.76
	PRS2	0.89	2.972					
	PRS3	0.831	2.112					
	PRS4	0.908	2.896					
Service Quality		SRQ1	0.847	2.221	0.889	0.924	0.751	
	SRQ2	0.905	3.215					
	SRQ3	0.852	2.247					
	SRQ4	0.863	2.315					
Trust	TRS1	0.822	2.123	0.903	0.928	0.72		
	TRS2	0.852	2.581					
	TRS3	0.847	2.532					
	TRS4	0.865	2.532					
	TRS5	0.857	2.48					

Source: Author's Compilation

Indicator Loadings and Multicollinearity Analysis

The measurement model was assessed by analyzing indicator loadings and multicollinearity diagnostics. All indicator loadings ranged from 0.777 to 0.908, much over the recommended threshold of 0.70 (Hair et al., 2017), showing strong and consistent relationships between observable variables and their respective constructs. VIF values used to test multicollinearity ranged from 1.966 to 3.418, which is significantly lower than the traditional threshold of 5.0 (Hair et al., 2019). Although one indicator (PEOU2) only above the tighter 3.3 threshold (VIF = 3.418), the difference was minor and not considered serious (Kock, 2015). These results confirm the measuring model's reliability and discriminant clarity.

Internal Consistency Reliability Assessment

The measurement scales' reliability was evaluated using Cronbach's alpha and composite reliability (CR). All Cronbach's alpha values above the recommended threshold of 0.70, ranging from 0.872 to 0.913, suggesting good item internal consistency (Nunnally and Bernstein, 1994). Composite reliability values varied from 0.912 to 0.935, supporting scale reliability and providing a more refined assessment by taking into consideration different indicator loadings (Hair et al., 2017). The consistently high values across both metrics demonstrate the measurement devices' stability and reliability.

Convergent Validity

Convergent validity was determined using AVE values. All constructs had AVE values ranging from 0.705 to 0.763, above the minimum threshold of 0.50 (Fornell & Larcker, 1981) and approaching the higher threshold of 0.70 for established scales (Hair et al., 2017). These findings suggest that every factor explains a significant percentage of the variance in its indicators. The FI construct had the greatest AVE (0.763), and the lowest (CUI = 0.705) still exceeded the threshold, indicating good convergent validity suitable for advanced structural modeling.

Discriminant Validity Assessment

To assess discriminant validity among the latent constructs in the structural model, two generally known approaches were used: the Fornell-Larcker criterion and the Heterotrait-Monotrait Correlation Ratio (HTMT).

Table: Fornell-Larker Criterion and HTMT Rations

Construct	CUI	DFL	FI	FINT	PEOU	PES	PRS	SRQ	TRS
CUI	0.840	0.591	0.547	0.551	0.515	0.569	0.565	0.601	0.542

DFL	0.535	0.868	0.556	0.536	0.519	0.563	0.534	0.547	0.570
FI	0.503	0.506	0.873	0.563	0.517	0.580	0.552	0.515	0.524
FINT	0.499	0.483	0.508	0.849	0.530	0.550	0.543	0.498	0.544
PEOU	0.476	0.474	0.476	0.482	0.861	0.548	0.504	0.448	0.529
PES	0.523	0.512	0.535	0.500	0.501	0.847	0.556	0.577	0.551
PRS	0.519	0.483	0.506	0.492	0.461	0.510	0.872	0.556	0.503
SRQ	0.544	0.490	0.469	0.446	0.407	0.522	0.501	0.867	0.512
TRS	0.496	0.516	0.480	0.491	0.485	0.503	0.460	0.462	0.849

Source: Author's Compilation

Convergent and discriminant validity have been confirmed with AVE, the Fornell-Larcker criterion, and HTMT. All AVE values varied between 0.705 to 0.763, exceeding the 0.50 threshold and demonstrating strong convergent validity. Discriminant validity was confirmed because the square root of each construct's AVE was greater than its correlations with other constructs, and all HTMT values were less than 0.85. These results validate the measurement model's convergent and discriminant validity.

Structural Model Results

The structural model evaluated the relationships between important factors associated with FinTech adoption and FI among Afghanistan's SMEs. The results supported most of the proposed hypotheses, with statistical significance at p <.05.

Table: Hypothesis Testing Results

Hypothesis	Path Tested	β	t	P	95% CI (LL – UL)	Result	Decision
H1: FinTech use positively influences FI in SMEs	FINT → FI	0.170	3.854	.000	[0.081, 0.255]	Sig	Yes
H2: PEOU positively influences FinTech use	PEOU → FINT	0.213	4.815	.000	[0.125, 0.298]	Sig	Yes
H3: PES positively influences FinTech use	PES → FINT	0.206	4.398	.000	[0.113, 0.297]	Sig	Yes
H4: TRS positively influences FinTech use	TRS → FINT	0.214	4.780	.000	[0.129, 0.302]	Sig	Yes
H5: FinTech use positively influences DFL (for mediation path)	FINT → DFL	0.483	15.150	.000	[0.418, 0.544]	Sig	Yes
H6: DFL positively influences FI	DFL → FI	0.215	4.273	.000	[0.114, 0.312]	Sig	Yes

H7: CUI moderates the relationship between DFL and FI	CUI × DFL → FI	0.190	5.095	.000	[0.118, 0.263]	Sig	Yes
H8: PRS moderates the relationship between FinTech use and FI	PRS × FINT → FI	0.082	1.815	.070	[-0.006, 0.169]	Not Sig	No
H9: SRQ positively influence FINT	SRQ → FINT	0.153	3.451	.001	[0.067, 0.238]	Sig	Yes

Source: Author's Compilation

The study found that using FinTech enhances financial inclusion for SMEs in Afghanistan (β = 0.170, p <.001), emphasizing the importance of digital services in overcoming financial barriers. PEOU has significant effects on FinTech adoption (β = 0.213, p <.001), indicating that SMEs are more inclined to use intuitive digital financial solutions. PS (β = 0.206, p <.001) and trust in FinTech providers (β = 0.214, p <.001) play significant roles in promoting adoption. FinTech use enhances DFL (β = 0.483, p <.001) and positively impacts FI (β = 0.215, p <.001). CUI moderates the relationship between DFL and FI (β = 0.190, p <.001), indicating the significance of ongoing engagement. But there was no significant moderating influence of PRS on the FinTech-FI relationships (β = 0.082, p =.070), suggesting that usability, trust, and literacy variables are more relevant in shaping FI outcomes.

Mediation

Table: Mediation (FINT→DFL→FI)

Pathway	Effect Type	B	t	p	Mediation Type
FINT → DFL → FI	Indirect Effect	0.104	4.056	.000	
FINT → FI (Direct)	Direct Effect	0.170	3.854	.000	
FINT → FI (Total)	Total Effect	0.274	5.795	.000	Partial Mediation

Source: Author's Compilation

A bootstrapping analysis with 5,000 resamples confirmed DFL's mediating role in the relationship between FinTech use and FI. The results showed a significant indirect effect (β = 0.104, t = 4.056, p <.001). The evidence suggests that FinTech adoption increases SMEs' digital financial competencies, resulting in better access to and use of formal financial services. As a result, DFL serves as a vital tool for increasing FI through the usage of FinTech.

Direct and Total Effects Analysis

Even after accounting for the mediating role of DFL, FinTech use retained a significant direct effect on FI (β = 0.170, t = 3.854, p <.001), showing that its influence extends beyond literacy improvements to aspects such as cost efficiency, convenience, and service access. FINT had

significant impacts on FI through both direct and indirect paths (β = 0.274, t = 5.795, p <.001), highlighting FinTech's complex role.

Moderation

Table: Moderation Analysis

Interaction Term	Path	β	T	p	Significance	Interpretation
PRS × FINT	FI	0.082	1.815	.070	Not Significant	No moderation
CUI × DFL	FI	0.190	5.095	.000	Significant	Moderation confirmed

Source: Author's compilation

The interaction between PRS and FinTech use on FI was not statistically significant (β = 0.082, t = 1.815, p = 0.070), indicating no moderating influence. However, the interaction between CUI and DFL on FI was significant (β = 0.190, t = 5.095, p <.001), indicating that CUI moderates this relationship. This means that the influence of DFL on FI varies according to SMEs' willingness to continue using digital financial services.

Simple Slope Analysis of the Effect of CUI and DFL on FI

Source: Smartpls output

A simple slope analysis revealed that CUI moderates the relationship between DFL and FI. The effect of DFL on FI was greatest at high CUI levels, moderate at middle CUI, and weakest at low CUI, where the slope was almost flat. This pattern indicates that DFL improves FI more successfully when users are regularly engaged with digital financial tools, supporting the existence of a significant moderation influence.

Table: Explanatory power of the Structural Model

Construct	R^2	R^2 Adjusted	Interpretation
DFL	.233	.232	Small to moderate explained variance
FI	.452	.446	Moderate to large explained variance
FINT	.379	.374	Moderate explained variance

Source: Author's Compilation

The structural model had moderate to strong explanatory power (R^2 = 0.452 for FI, 0.379 for FinTech use, and 0.233 for DFL). The findings

show that the model explains approximately 45% of FI variance, a moderate level for FINT, and a weaker but acceptable level for DFL, implying that other factors may possibly influence digital literacy.

Table: Predictive Validity of Structural Model

Construct	Q^2predict	RMSE	MAE	Mean Error	Error SD	Skewness
DFL	.288	0.847	0.693	.000	0.847	-0.529
FI	.397	0.779	0.598	-.067	0.776	-0.486
FINT	.368	0.798	0.607	.000	0.798	-0.474

Source: Author's Compilation

PLS-Predict revealed positive Q^2 values for FI (0.397), FinTech use (0.368), and DFL (0.288), showing strong predictive relevance. FI had the highest predictive power, as evidenced by the lowest error metrics (RMSE = 0.779; MAE = 0.598), confirming the model's accuracy and good out-of-sample prediction.

Discussion

Perceived Ease of Use

The study confirms that PEOU has a significant positive effect on FinTech adoption among SMEs ($\beta = 0.213$, $p < .001$), which is in line with previous research (Nugraha et al., 2022; Mahmoud et al., 2025). Several researchers emphasize the relevance of PEOU in changing behavioral intention and usage (Purwanto et al., 2024; Nurunnisha, 2020), with similar impacts observed in QRIS and mobile payment contexts (Rahmalia et al., 2024; Ramadhani et al., 2025). PEOU, along with trust and religiosity, have been highlighted in Islamic FinTech research (Alrasyid et al., 2023; Kurniasari & Utomo, 2019), while some studies imply that financial literacy may be more influential (Hasyim et al., 2023). PEOU's influence is further enhanced by interface design and digital literacy (Edo et al., 2024; Ikwanto & Indriani, 2024). Regional evidence from Oman, Nigeria, Kenya, and Ghana reveals ease of use as an important determinant in adoption (Bhat et al., 2024; Adah et al., 2025; Coffie et al., 2021). However, contradictory findings (Silaya, 2022; Zena & Susanto, 2022) indicate that contextual modertors which include trust and support influence PEOU's effectiveness (Lestari et al., 2022; Pentury, 2023).

Perceived Security

This study reveals perceived security strongly influences FinTech use among SMEs (β = 0.206, p <.001), confirming with prior studies stressing security as crucial for digital adoption (Wijaya et al., 2025; Mahmoud et al., 2025). Security underlies trust, particularly in crisis situations (Nugraha et al., 2022), and is associated with regulatory compliance and digital readiness (Halawa et al., 2025). Poor infrastructure and low literacy raise security problems, but user-friendly secure platforms foster inclusion (Okoh et al., 2025; Adah et al., 2025). Security is important in all FinTech services and is especially important in Islamic banking due to ethical considerations (Mahmoud et al., 2025). It additionally improves satisfaction and retention (Rahmawati & Merlinda, 2024), with literacy and trust contributing to overcome challenges (BASAR et al., 2024; Purwanto et al., 2024). Regional studies show that security has a broad impact, influenced by socioeconomic and business traits (Karim et al., 2022; Coffie et al., 2021). While some research identifies complicated effects of perceived risk and confidence (Purwantini & Anisa, 2021; Rauf et al., 2024), trust and security remain critical to long-term adoption, though PRS has no moderating influence (Halawa et al., 2025).

Trust

This study reveals that trust strongly influences FinTech use among SMEs (β = 0.214, p <.001), emphasizing its crucial role in technology adoption and FI. Prior research has identified trust as a mediator between IT quality and usage (Alamoudi et al., 2025; Al-Qudah et al., 2025) and emphasized its importance in addressing issues related to privacy and security (Shuhaiber et al., 2025). Trust lowers perceived risks (Wang et al., 2024), compensates for insufficient financial literacy (Khan et al., 2023), and is enhanced by digital literacy and regulatory support (Singh & Sharma, 2024). Trust is impacted by cultural and ethical aspects, especially in halal FinTech (Nuri, 2025), while transparency and ethical practices strengthen it (Zhang et al., 2023; Vasquez & San-Jose, 2022). Regional studies emphasize the importance of trust across sectors and in post-COVID contexts (Alhajjaj & Ahmad, 2022; Chawla et al., 2023). Overall, trust remains an important, though context-sensitive, driver of FinTech adoption and utilization.

Service Quality

This study demonstrates that perceived SRQ strongly influences FinTech use among SMEs (β = 0.206, p <.001), suggesting its importance in adoption and FI. According to the literature, features such as reliability, responsiveness, assurance, and empathy improve user satisfaction and increase TAM's predictive potential (Sharma et al., 2023; Aldaarmi, 2024). Culturally appropriate SRQ, particularly in Islamic contexts, increases adoption (Baber, 2019; Wibowo & Bakri, 2024), with trust mediating risk reduction (Wang & Lin, 2022). Quality features such as information security and recovery services enhance loyalty (Fan, 2024; Jerene & Sharma, 2020). Regional studies confirm the system and SRQ's impact, which is reduced by cultural and socioeconomic factors (Kim et al., 2023; Shaikh et al., 2023). Emerging AI-powered services promote

SMEs growth and financial access (El-Shihy et al., 2024; Odeh et al., 2025). To maintain adoption, digital transformation and customized support are suggested (Daga et al., 2021; Utami, 2022), making SRQ critical for long-term inclusion and trust.

FINT use and FI

This study reveals that FinTech adoption significantly promotes financial inclusion among SMEs (β = 0.170, p <.001), enhancing global evidence of its transformative impact on marginalized businesses (Makina, 2019; Rasheed et al., 2019). FinTech tools such as mobile money and peer-to-peer lending assist in overcoming traditional challenges (Jagtiani & Lemieux, 2017), and regional studies support their significance in enhancing MSMEs access and lowering inequality (Gupta & Sharma, 2020; Aleemi et al., 2023). Challenges such as digital illiteracy and infrastructure gaps persist (Ediagbonya & Tioluwani, 2023), as demands for further regulatory support (Ozili). Behavioral characteristics such as simplicity of use, trust, and literacy are critical for adoption (Goswami et al., 2022), and Islamic FinTech shows potential despite limited awareness (Yuneline, 2022). Addressing local challenges and promoting inclusive design and collaborations are critical for maintaining SMEs resilience and FI (Pizzi et al., 2021; Ghosh & Vinod, 2022).

DFL and FI through FINT

This analysis demonstrates that FinTech adoption positively influences FI among SMEs (β = 0.170, p <.001), with DFL playing a critical enabling role. According to research, DFL serves as both an outcome and a driver of FinTech adoption, influencing the relationships between experience, mobile money, and inclusion (Amnas et al., 2024; Zaimovic et al., 2025; Khan et al., 2024). DFL is also known to have a moderating influence on SMEs performance and inclusion quality, particularly after COVID (Okello Candiya Bongomin et al., 2025; Joy et al., 2025). DFL promotes financial empowerment for women and disabled people, but it has limitations where formal education promotes risk aversion (Hasan et al., 2023; Zhang & Fan, 2024). Cross-national evidence connects DFL to sustainable entrepreneurship and inclusive ecosystems (Basar et al., 2024; Rini & Soma, 2025).

Perceived Regulatory Support

This study showed that PRS does not significantly affect the relationship between FinTech use and FI among SMEs in Afghanistan (β = 0.082, p = 0.070), which contradicts literature that emphasizes the role of regulatory frameworks (Amnas et al., 2024; Noreen et al., 2022). While trust and ease of use greatly influence FinTech adoption in fragile environments such as Afghanistan, regulatory impact appears to be limited due to institutional capacity and enforcement constraints (Gurrea-Martinez & Remolina, 2020; Lee, 2024). Effective policy demands not only design but also implementation and community interaction (Chen & Divanbeigi, 2019). Studies that indicate significant moderation by regulation are typically conducted in countries with stronger regulatory environments (Pyoko et al., 2023; Opiyo et al., 2024).

Continued Usage Intention

This study finds that CUI significantly moderates the relationship between DFL and FI among Afghan SMEs (β = 0.190, t = 5.095, p <.001), highlighting the significance of ongoing FinTech engagement. This validates previous research indicating that trust, satisfaction, incentives, and ease of use are critical aspects of CUI (Pal et al., 2020; Ramindran & Lee, 2024; Rizvee et al., 2025). Digital literacy, trust, and perceived value all have an effect on post-adoption behaviors. According to studies carried out in Asia and Africa, continuous use is driven by social influence, satisfaction, and task-technology fit. Trust is the most constant enabler (Gui et al., 2024; Sanchez & Tanpoco, 2023), but discontinuance is frequently caused by gaps in vendor reliability and user confidence (Sait et al., 2024).

Conclusion and Recommendations

Conclusion

This study provides strong empirical evidence for the significance of FinTech in promoting FI among Afghanistan's SMEs. The findings confirm that FinTech use significantly improves FI, both directly and indirectly through improved DFL. Key factors influencing FinTech adoption include perceived ease of use, security, trust, and service quality. Furthermore, DFL emerged as a key mediating factor, connecting FinTech adoption to increased financial access. SMEs with stronger digital financial capabilities are better positioned to use FinTech to achieve inclusive financial outcomes. Additionally, the moderation analysis showed that CUI considerably enhances the effect of DFL on FI, emphasizing the necessity of consistent engagement with digital tools. However, PRS did not significantly influence the FinTech-FI relationship, indicating that internal user considerations may be more important than external institutional support in the current Afghanistan context. The model had moderate to great explanatory and predictive power, particularly regarding financial inclusion. Overall, the findings show the multifaceted and interactive nature of FinTech's impact on financial inclusion in fragile and developing countries, emphasizing the necessity for focused literacy and engagement initiatives to fulfill its full potential.

Recommendations

Several strategic initiatives have been proposed to increase financial inclusion among Afghanistan's SMEs. First, government agencies, non-governmental organizations (NGOs), and fintech developers should invest in DFL programs. These activities should include targeted workshops, smartphone tutorials, and local-language support to help SMEs better grasp and apply digital financial technologies. Second, FinTech providers must encourage continuous usage by creating user-friendly interfaces and customer experiences that foster long-term engagement. Incorporating features like usage reminders, loyalty rewards, and instructional nudges can dramatically increase DFL's benefits for financial inclusion.

Third, improving trust and security is vital, as these aspects heavily affect FinTech adoption. To develop user trust, providers must adopt strong cybersecurity safeguards, keep user policies transparent, and provide suitable grievance redressal channels. Fourth, simplifying the user experience is essential, especially for SMEs with limited digital literacy. To guarantee widespread acceptance, fintech applications should be easy, multilingual (particularly in Pashto and Dari), and created with accessibility in mind.

Fifth, there is a need to reconsider regulatory actions. The study discovered no significant moderating effect of perceived regulatory support, which could be attributed to insufficient awareness. Policymakers should make rules more visible, accessible, and user-friendly for SMEs, as well as conduct focused awareness initiatives. Sixth, support for inclusive innovation in unstable economies is critical. Donors and international financial institutions should prioritize investments in low-data FinTech solutions, offline capabilities, and platforms that interact with established financial systems.

Seventh, developing public-private collaboration is critical for expanding digital financial services. Coordinated initiatives by government agencies, FinTech firms, and development groups can help scale solutions and enhance digital infrastructure, particularly in underserved rural and conflict-affected areas. Finally, future research should look into other potential moderating factors like access to infrastructure, gender dynamics, and mobile penetration. Longitudinal studies are also suggested for tracking how FinTech usage and impacts change over time.

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