

Digital Collection Challenges in Mumbai's Microfinance Sector

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ABSTRACT

The rapid digitization of financial services has opened new pathways for financial inclusion, yet the adoption of digital collection systems within India's microfinance sector remains uneven. This study investigates the behavioral and institutional factors influencing the use of FinTech platforms for digital collections in the urban microfinance ecosystem of Mumbai. Drawing upon a synthesis of the Technology Acceptance Model (TAM), Diffusion of Innovation (DoI), and Institutional Trust Theory, the research proposes and tests a conceptual model integrating seven constructs: trust in digital systems, perceived transaction security, service quality, perceived regulatory support, digital financial confidence, FinTech use, and inclusive financial behavior.

Using data from 608 microfinance customers collected via a structured questionnaire and analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM), the study confirms that trust, security, and service quality significantly drive FinTech adoption. Digital financial confidence emerges as a critical mediator between FinTech use and inclusive behavior, while perceived regulatory support moderates this relationship. The findings advance theoretical understanding by positioning digital financial literacy as an enabler rather than an outcome of inclusion and highlighting the regulatory environment as a boundary condition.

The study offers actionable insights for policymakers, FinTech providers, and MFIs to foster user trust, enhance digital capabilities, and design inclusive digital collection strategies aligned with local realities. Implications are particularly relevant to urban financial inclusion efforts in rapidly digitizing economies.

Key Words: *FinTech, financial inclusion, digital collections, microfinance, Mumbai, digital literacy, regulatory support*

1. INTRODUCTION

Financial inclusion, the ability to access affordable and appropriate financial services, remains a pressing developmental challenge. Despite the rise of digital finance, large urban populations, including those in Mumbai, remain excluded from the formal

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financial ecosystem. This gap is not due to a lack of technology, but rather the layered barriers faced by underserved populations in using digital platforms (Sinha et al., 2018).

FinTech innovations such as mobile money, biometric tools, and API-based systems have expanded outreach by minimizing physical infrastructure needs (Aracil et al., 2025). Yet, digital access alone does not ensure meaningful usage. As Sinha et al. (2018) caution, user capacity must be central to FinTech deployment, particularly in low-income and informal communities.

Mumbai exemplifies this paradox. It boasts high digital penetration but houses a microfinance clientele that struggles with low digital literacy, resistance to change, and infrastructural constraints (Shalini & Sabitha, 2024). Despite supportive policies like Digital India and UPI, digital collection adoption among MFIs has been inconsistent.

Challenges, ranging from transaction delays and fraud to limited grievance redressal, especially affect women, migrants, and daily-wage earners (Aracil et al., 2025). The COVID-19 push toward digitization often occurred without adequate user handholding, resulting in symbolic rather than substantive inclusion (Dananjayan et al., 2023).

Traditionally, microfinance loan collections were conducted through in-person meetings at designated group centers, where field officers manually recorded payments, collected cash, and issued paper receipts. This approach, while fostering human contact and social accountability, was resource-intensive, prone to errors, and often delayed reconciliation. In contrast, digital collection cycles use mobile apps, UPI interfaces, and biometric or OTP authentication for real-time payments, reducing human dependency and processing time. However, this shift demands higher digital literacy and trust in system security. Comparing both cycles reveals a trade-off: while digital systems enhance efficiency and transparency, they also introduce new exclusion risks for clients unfamiliar with digital tools.

Institutional trust is pivotal. As Morgan (2022) notes, FinTech adoption hinges on policy clarity and ecosystem trust, especially for semi-formal actors and last-mile users. This study explores digital collection challenges in Mumbai's microfinance sector by examining the intersections of infrastructure, user capability, behavioral readiness, and regulatory support.

By focusing on Mumbai, a microcosm of both digital progress and inequality, this paper seeks to highlight operational gaps, user perspectives, and policy implications for building inclusive FinTech ecosystems.

2. THEORETICAL FOUNDATION, REVIEW OF LITERATURE, AND HYPOTHESIS DEVELOPMENT

2.1 Theoretical Foundation

This study builds upon the **Technology Acceptance Model (TAM)** and **Diffusion of Innovations (DoI)** framework to understand digital collection adoption. However, to deepen our contextual grounding in the urban microfinance ecosystem of Mumbai, it is crucial to consider the **Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)**. Particularly, the dimension of **Effort Expectancy**, which refers to the ease of use perceived by the user, becomes salient for low-literacy microfinance clients often excluded from mainstream digital ecosystems. Integrating UTAUT2 allows for explaining **behavioral inertia** among digitally unskilled borrowers, especially women and older adults.

Moreover, contrasting **TAM's perceived usefulness** with **Value-based Adoption Model (VAM)**'s emphasis on net value perception offers a more holistic interpretation of FinTech value realization. While TAM focuses on cognitive evaluation of usefulness, VAM integrates **cost, risk, and effort** in evaluating adoption decisions, which is especially relevant in informal urban settlements where perceived data risk or transaction errors can disproportionately affect economically vulnerable users (Morgan, 2022).

Simultaneously, the **Diffusion of Innovation (DoI) Theory** (Rogers, 2003) helps examine the broader spread of digital collection systems across heterogeneous borrower groups. It emphasizes adopter categories, innovation characteristics (like compatibility and trialability), and the influence of social systems. In Mumbai's microfinance landscape, early adopters of digital collection may influence neighboring borrowers through community interactions and shared experiences, but adoption also hinges on infrastructure reliability, agent behavior, and digital trust (Sinha et al., 2018).

Furthermore, the construct of **Perceived Regulatory Clarity**, adapted from institutional theory, has also been integrated. In emerging FinTech environments, user confidence is often contingent on visible, predictable regulatory protections (Morgan, 2022). For many MFI clients, particularly women and informal workers, institutional support signals that digital systems are legitimate and safe.

By integrating these perspectives, the study builds a causal path model examining how **trust**, **service quality**, and **security perceptions** influence digital collection adoption, which in turn affects **digital financial confidence** and ultimately **inclusive financial behavior**, with **policy clarity** moderating this relationship.

2.2 Trust in Digital Collection Systems

Trust reflects users' confidence in the reliability and intent of digital collection interfaces deployed by MFIs. In urban microfinance contexts, especially among borrowers with low digital exposure, trust is foundational. Users must believe that repayment amounts won't be misdirected, that the app functions reliably, and that their data are secure. Sinha et al. (2018) highlighted that in financially fragile populations, even minor tech failures can lead to long-term disengagement. Aracil et al. (2025) observed that trust, more than convenience, drives continued mobile money usage in emerging economies.

H1: Trust in digital collection systems significantly and positively influences digital collection adoption.

2.3 Quality of Tech-Enabled MFI Services

Service quality includes interface usability, response time, app uptime, availability of multilingual support, and human support channels. In the digital collection context, many Mumbai-based MFIs deploy white-label apps or partner FinTech interfaces, which vary in quality and user intuitiveness. Shalini and Sabitha (2024) argue that usability friction, such as unclear navigation or confusing transaction summaries, reduces adoption among first-time users.

H2: Perceived service quality of digital collection platforms significantly and positively influences digital collection adoption.

2.4 Perceived Transaction Security

Security concerns often deter borrowers from fully engaging with digital systems. These concerns include fears of data breaches, incorrect deductions, phishing, and app-based fraud. For microfinance clients, who operate on tight financial margins, even the perception of risk leads to avoidance. Dananjayan et al. (2023) report that secure-feeling platforms saw more voluntary usage, even in the absence of agent nudging.

H3: Perceived security of digital collection platforms significantly and positively influences digital collection adoption.

2.5 Digital Collection Adoption and Inclusive Financial Behaviour

While many MFIs in Mumbai have technically enabled digital collection systems, usage remains inconsistent. For adoption to translate into financial inclusion, users must not only pay digitally but also interact with other features, like tracking payments, viewing balances, or requesting loan top-ups. As Morgan (2022) emphasized, financial inclusion must be assessed not by access alone, but by usage depth and continuity.

H4: Digital collection adoption significantly and positively influences inclusive financial behaviour.

2.6 Digital Collection and Digital Financial Confidence

Repeated engagement with digital collection interfaces gradually builds confidence in navigating digital financial environments. Borrowers who successfully repay via app are more likely to explore savings features, compare credit products, or ask questions. Aracil et al. (2025) suggest that familiarity breeds trust, and that FinTech literacy develops organically when users are given agency and reliable feedback mechanisms.

H5: Digital collection adoption significantly and positively influences digital financial confidence.

2.7 Digital Financial Confidence and Inclusive Financial Behaviour

Digital financial confidence refers to users' belief in their own ability to navigate digital financial tools. This goes beyond literacy to include self-efficacy, perceived control, and emotional comfort. Shalini and Sabitha (2024) observed that borrowers who developed confidence were more likely to explore new products or raise disputes proactively.

H6: Digital financial confidence significantly and positively influences inclusive financial behaviour.

2.8 Digital Financial Confidence as a Mediator

Although digital collection adoption enhances access, the transformation into deeper inclusion requires internal readiness, digital financial confidence. Borrowers may use the app for repayments but remain disengaged from formal finance if they lack confidence in interpretation, follow-up, or seeking support. As Dananjayan et al. (2023) argue, the quality of digital engagement, not just the quantity, is critical.

H7: Digital financial confidence mediates the relationship between digital collection adoption and inclusive financial behaviour.

2.9 Policy Clarity as a Moderator

In microfinance, perceived regulatory protection and institutional endorsement significantly shape user confidence. Borrowers are more likely to adopt and continue digital usage when they perceive the system as being monitored and redressal-friendly. Morgan (2022) notes that regulatory clarity signals stability, which is critical in populations with historical mistrust of formal finance.

H4a: Policy clarity moderates the relationship between digital collection adoption and inclusive financial behaviour such that higher clarity strengthens the relationship. The conceptual model is presented in Figure 1.

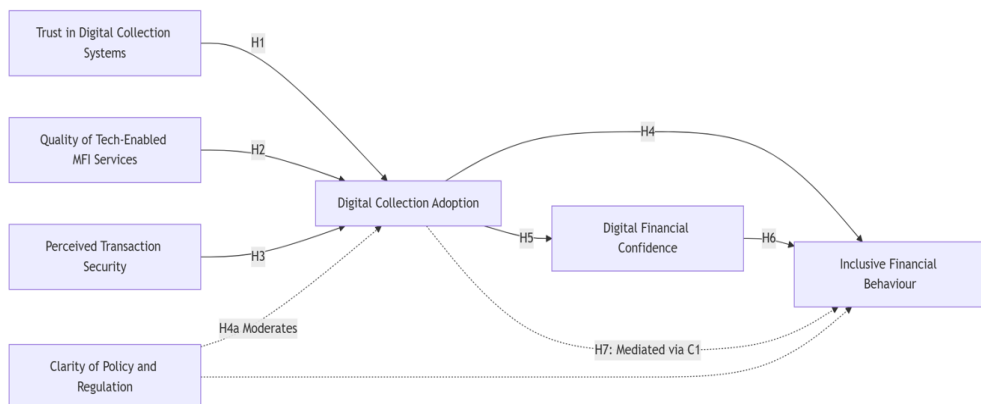


Figure 1. The conceptual model. Source: the authors. Source: the authors

3. RESEARCH METHODOLOGY

3.1 Measurement Development

To operationalize the constructs in this study, a comprehensive research framework was developed based on validated theoretical insights and adapted empirical measures. The structural model comprises seven core variables: **trust in digital collection systems**, **quality of tech-enabled MFI services**, **perceived transaction security**, **digital collection adoption**, **digital financial confidence**, **inclusive financial behaviour**, and **perceived policy clarity**. These variables were measured using multiple-item scales adapted from existing literature and refined to suit the specific context of **digital collection in Mumbai's microfinance sector**. The visual representation of the proposed framework is shown in *Figure 1*.

Each variable was measured with 3–5 items, ensuring content validity while allowing for statistical reliability during factor analysis. The items used to measure **trust** were adapted and modified to reflect digital repayment environments, with references to the credibility of transaction records, platform reliability, and trust in MFI-linked digital tools (Sinha et al., 2018; Aracil et al., 2025). The **perceived transaction security** construct included items on data protection, SMS alert authenticity, and user confidence in app-based transactions, drawing from prior frameworks employed in South Asian FinTech contexts (Shalini & Sabitha, 2024).

The **quality of tech-enabled MFI services** was measured using items adapted from service quality literature, covering digital responsiveness, app functionality, clarity of communication, and multilingual interface availability, aligned with recent discussions on FinTech service delivery to financially underserved users (Dananjayan et al., 2023).

To measure **digital collection adoption**, we modified existing FinTech usage scales by reframing items to explicitly capture borrower interactions with MFI-linked digital platforms for repayments and account inquiries. This construct did not generalize FinTech adoption across savings, investments, or insurance, but focused specifically on app-based loan servicing and repayment frequency, aligned with the Mumbai MFI model (Aracil et al., 2025; Morgan, 2022).

The construct **digital financial confidence** was introduced to capture the behavioural readiness and perceived self-efficacy of users navigating digital repayment systems. It was measured using items adapted from prior digital capability research but customized to reflect the context of repeat usage, perceived ability to resolve issues

independently, and ease of interpreting app-based financial information (Shalini & Sabitha, 2024).

Inclusive financial behaviour was captured through indicators like use of formal repayment modes, inquiry behavior, digital communication with MFIs, and awareness of one's repayment schedule. These items were derived from financial inclusion measurement scales, adjusted for the context of technology-mediated engagement (Sinha et al., 2018).

The construct **perceived policy clarity** was measured through items capturing user awareness of grievance mechanisms, institutional legitimacy, integration with Aadhaar/UPI systems, and perception of government endorsement of the platform. These items were contextualized from broader FinTech trust models in regulatory contexts (Morgan, 2022; Dananjayan et al., 2023).

All items were measured on a **five-point Likert scale**, ranging from **1 = Strongly Disagree** to **5 = Strongly Agree**. This scaling approach balances simplicity for respondents and robust statistical suitability for confirmatory factor analysis.

The questionnaire was structured in two parts. The **first section** captured demographic and contextual variables, including age, gender, education level, smartphone access, and prior experience with digital repayment. The **second section** captured respondent perceptions across the seven constructs.

Before full-scale deployment, the questionnaire was subjected to expert validation and pilot testing. Feedback was solicited from **two FinTech professionals** working in MFI digitization and **four academic experts** in financial inclusion and digital behavior. Their suggestions were integrated to refine item phrasing, eliminate ambiguous terms, and adjust question order to improve survey flow and minimize fatigue.

A **pilot study with 30 MFI customers** was conducted to assess item clarity, response variability, and internal consistency. Based on this, minor linguistic adjustments were made, and certain items were reordered for thematic continuity. Attention was also paid to ensure the Google Forms interface did not overwhelm users. Only critical items were made mandatory to avoid discouraging participation from semi-literate or time-constrained respondents.

The resulting instrument achieved both contextual sensitivity and methodological rigor, allowing for reliable measurement of latent constructs central to understanding digital collection dynamics in Mumbai's microfinance ecosystem.

3.2 Sample and Data Collection

This study targeted individuals actively engaged with digital collection platforms offered by microfinance institutions (MFIs) in the Mumbai region. Given the absence of an official registry of digital borrowers using FinTech interfaces for loan repayments, a **non-probability sampling approach** was adopted, specifically a mix of **convenience** and **snowball sampling** techniques, following precedents set by contemporary FinTech studies (Sinha et al., 2018; Dananjayan et al., 2023).

The survey instrument was developed using Google Forms and was designed in both English and Hindi to accommodate linguistic diversity among respondents. The link was distributed via multiple digital channels, including **WhatsApp, Telegram, community Facebook groups, and MFI-led WhatsApp broadcast lists**, enabling outreach to a broad cross-section of digital borrowers. Initial respondents were encouraged to forward the form to peers within their borrowing or MFI-linked networks, allowing for a decentralized diffusion of the survey link.

In terms of selecting MFIs for participant outreach, the study employed a purposive selection strategy. Five MFIs operating within Mumbai and the extended MMR region were initially shortlisted based on two criteria: (a) active deployment of digital repayment platforms (app- or UPI-based), and (b) willingness to disseminate the survey link through their borrower communication channels. These MFIs represented a mix of small and mid-sized institutions, including both NBFC-MFIs and SFB-linked MFIs. Informal consultations with MFI officers confirmed their use of digital collection interfaces, and institutional permission was secured where needed. The purposive selection of these institutions ensured contextual relevance, while the customer sampling within them remained non-probabilistic.

The data collection period spanned **three months, from September to November 2023**, and was conducted entirely online. Respondents were informed about the purpose of the study, provided consent, and were assured of complete anonymity and confidentiality.

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A total of **608 valid responses** were received, all of which were used in the final analysis. The sample size exceeds the minimum threshold recommended by **G*Power 3.1**. With **five predictors** in the structural model, a **sample of 138** was deemed sufficient to detect a medium effect size (0.15) with **95% power** at a 5% significance level (Faul et al., 2007). Thus, the actual sample size, more than **four times larger** than required, provided high statistical robustness and model reliability.

To check for **non-response bias**, the responses from the first 75 participants were compared with the last 75 across key variables. Independent sample t-tests revealed no statistically significant differences between these groups, affirming the absence of non-response bias and temporal distortion.

The **demographic profile** of the respondents is detailed in *Table 1*. The gender distribution was nearly balanced (50.66% male, 49.34% female). Most respondents were aged **15–35 years**, reflecting the age band most comfortable with mobile technology. In terms of educational background, **nearly 67% held a graduate or post-graduate qualification**, a possible reflection of the urban sample's digital readiness. Additionally, while **60.69% belonged to rural peripheries**, they were active participants in digital collection via mobile-based MFIs, highlighting the reach of FinTech into semi-urban and rural outskirts of Mumbai.

Regarding FinTech usage patterns:

- **49.84% had more than 5 years of experience** engaging with digital financial platforms.
- **47.2% reported always using FinTech tools** for financial services, including MFI repayments.
- A further **28.45% used it often**, suggesting a majority of the sample had habitual interaction with digital finance platforms.

Table 1. Demographic profile of the respondents. Source: the authors

Demographic Variable	Groups	Frequency (n)	Percentage (%)
Gender	Male	308	50.66
	Female	300	49.34
Age (in years)	15–25	251	41.28
	26–35	205	33.72
	36–45	61	10.03
	46–55	56	9.22
	Above 55	35	5.76

Education Level	Primary	17	2.8
	Secondary	92	15.13
	Graduation	226	37.17
	Post-graduation	186	30.59
	Professional Qualification	87	14.31
Place of Residence	Greater Mumbai Region	369	60.69
	Extended Mumbai Metropolitan Area (MMR)	239	39.31
Experience in FinTech Use	Less than 1 year	47	7.73
	1–3 years	119	19.57
	2–5 years	139	22.86
	More than 5 years	303	49.84
Frequency of FinTech Use	Rare	28	4.61
	Sometimes	120	19.74
	Often	173	28.45
	Always	287	47.2

4. DATA ANALYSIS AND RESULTS

This section presents the empirical findings derived through **Partial Least Squares Structural Equation Modeling (PLS-SEM)**, using **SmartPLS 4.0**, as recommended for complex models with formative and reflective constructs and medium-sized datasets (Hair et al., 2019). The analysis includes tests for **common method bias (CMB)**, assessment of the **measurement model**, and preliminary indicators of **structural model fitness**.

4.1 Common Method Bias (CMB) Test

Given the single-source nature of data collection (self-reported survey), the study took a dual-pronged approach to assess the possibility of **common method bias (CMB)**, which may arise when measurement errors are introduced due to shared data collection methods rather than the constructs themselves (Podsakoff et al., 2003).

First, we employed **Harman’s one-factor test**, which indicated that the **first factor accounted for only 48.55% of the total variance**, well below the critical 50% threshold, suggesting that no single latent factor dominates the variance, and hence, common method variance is unlikely to be a major concern.

Second, a **full collinearity test** was conducted as proposed by Kock (2015), in which **variance inflation factor (VIF)** values were examined across all latent constructs. The results indicated that **all VIF scores were below 3.3**, confirming that multicollinearity was not present and reinforcing that **CMB was not a threat** to the validity of this dataset.

4.2 Assessment of Measurement Model

To ensure the reliability and validity of the constructs used in the study, a rigorous assessment of the **measurement model** was performed as per PLS-SEM guidelines (Hair et al., 2021).

Although covariance-based SEM (CB-SEM) is traditionally recommended for confirmatory models, the selection of SmartPLS 4.0 and variance-based Partial Least Squares SEM (PLS-SEM) is methodologically justified in the context of this study. The research objective focuses not only on validating a theoretical model but also on predicting behavioral patterns of digital collection adoption in a real-world, underexplored context—urban microfinance in Mumbai. PLS-SEM is well-suited for such predictive and practice-oriented studies, especially when the model includes complex relationships involving mediating and moderating variables, such as digital financial confidence and perceived regulatory support. Moreover, PLS-SEM accommodates non-normal data distributions and maximizes the explained variance of key endogenous constructs, aligning with the study's goal of understanding adoption drivers and financial inclusion outcomes. Given the evolving nature of FinTech behaviors among microfinance clients, the selection of PLS-SEM offers greater robustness and external validity. This approach is also consistent with recent empirical research in the domains of digital finance, financial inclusion, and behavioral technology adoption (Hair et al., 2021; Henseler et al., 2016; Ravikumar et al., 2022; Sinha et al., 2018).

Internal Consistency and Reliability

Two primary indices, **Cronbach's alpha** and **Composite Reliability (CR)**, were used to evaluate the internal consistency of the constructs. As shown in Table 2, all constructs recorded Cronbach's alpha values **ranging from 0.816 to 0.913**, and CR values also exceeded the **threshold of 0.70**, thereby demonstrating strong internal consistency and scale reliability (Henseler et al., 2016).

Convergent Validity

The **Average Variance Extracted (AVE)** was used to assess **convergent validity**. As per the recommended threshold ($AVE > 0.50$), all constructs in the model met the criterion (see Table 2), indicating that each construct captures more variance from its indicators than from error terms (Hair et al., 2021).

Discriminant Validity

To ensure that each construct was empirically distinct from the others, the **Fornell–Larcker criterion** was applied. As displayed in Table 3, the **square root of AVE values for each construct exceeded its correlations with all other constructs**, confirming satisfactory discriminant validity (Fornell & Larcker, 1981).

Multicollinearity Diagnostics

In addition to the VIF values assessed for CMB, **construct-level VIF scores** were reviewed to detect multicollinearity in the measurement model. All constructs exhibited **VIF values ranging from 1.551 to 2.656**, remaining below the critical threshold of 3 (Hair et al., 2021). This confirms the absence of multicollinearity issues.

Table 2. Reliability and convergent validity. Source: the authors

Construct	Items	Loadings	Cronbach's Alpha	Composite Reliability	AVE
Perceived Security	PS1 – PS4	0.795–0.847	0.837	0.891	0.67
Trust	TR1 – TR4	0.821–0.876	0.872	0.913	0.72
Service Quality	SQ1 – SQ4	0.808–0.851	0.867	0.909	0.72
FinTech Use	FU1 – FU4	0.807–0.874	0.847	0.897	0.69
Financial Inclusion	FI1 – FI4	0.721–0.886	0.844	0.896	0.68
Digital Financial Literacy	DFL1 – DFL4	0.747–0.845	0.816	0.879	0.65

Note: AVE = Average Variance Extracted. All constructs meet the thresholds for convergent validity ($AVE > 0.50$) and internal reliability (α and $CR > 0.70$). Loadings are reported as observed; all are above 0.70.

Table 3. Discriminant validity: Fornell–Larcker Criterion. Source: the authors

Construct	DFL	FI	FU	PRS	PS	SQ	TR
Digital Financial Literacy	0.8						
Financial Inclusion	0.79	0.83					
FinTech Use	0.73	0.74	0.83				
Perceived Regulatory Support	0.66	0.67	0.64	0.8			
Perceived Security	0.68	0.66	0.66	0.64	0.82		
Service Quality	0.65	0.66	0.66	0.72	0.66	0.85	
Trust	0.65	0.68	0.65	0.77	0.73	0.74	0.85

4.3 Assessment of the Structural Model

After confirming the reliability and validity of the measurement model, we proceeded to evaluate the research hypotheses using **PLS-SEM** with SmartPLS 4.0. The structural model was analyzed through the estimation of **path coefficients (β)**, **standard deviations**, **t-statistics**, and **p-values** for each hypothesized relationship.

As presented in **Table 4**, the analysis revealed that:

- **Trust ($\beta = 0.210$; $p < 0.001$),**
- **Service Quality ($\beta = 0.304$; $p < 0.001$), and**
- **Perceived Security ($\beta = 0.301$; $p < 0.001$)**

had statistically significant positive effects on **FinTech Use**, thus supporting **H1**, **H2**, and **H3** respectively.

FinTech Use significantly influenced **Financial Inclusion** ($\beta = 0.281$; $p < 0.001$), validating **H4**. Additionally, it had a strong and significant impact on **Digital Financial Literacy** ($\beta = 0.729$; $p < 0.001$), thereby confirming **H5**. Digital Financial Literacy, in turn, significantly predicted **Financial Inclusion** ($\beta = 0.482$; $p < 0.001$), confirming **H6**. Mediation analysis showed that the indirect effect of FinTech Use on Financial Inclusion through Digital Financial Literacy was also statistically significant ($\beta = 0.352$; $p < 0.001$), supporting **H7**. Furthermore, the interaction effect of **Perceived Regulatory Support** on the relationship between FinTech Use and Financial Inclusion ($\beta = 0.053$; $p < 0.01$) was significant, establishing **H8** as supported.

This moderation effect is graphically illustrated in **Figure 2**, which shows a stronger positive slope when perceived regulatory support is high, affirming the moderating role of this construct.

Table 4. Results of Hypothesis Testing. Source: the authors

Hypothesis	Path	β	Standard Deviation	T Statistic	p-Value	Decision
H1	TR $\rightarrow$ FU	0.21	0.059	3.553	0	Supported
H2	SQ $\rightarrow$ FU	0.3	0.054	5.673	0	Supported
H3	PS $\rightarrow$ FU	0.3	0.063	4.797	0	Supported
H4	FU $\rightarrow$ FI	0.28	0.043	6.473	0	Supported
H5	FU $\rightarrow$ DFL	0.73	0.025	29.425	0	Supported
H6	DFL $\rightarrow$ FI	0.48	0.045	10.669	0	Supported
H7	FU $\rightarrow$ DFL $\rightarrow$ FI	0.35	0.032	11.082	0	Supported
H8	PRS $\times$ FU $\rightarrow$ FI	0.05	0.02	2.631	0.009	Supported

Note: TR = Trust, SQ = Service Quality, PS = Perceived Security, FU = FinTech Use, FI = Financial Inclusion, DFL = Digital Financial Literacy, PRS = Perceived Regulatory Support.

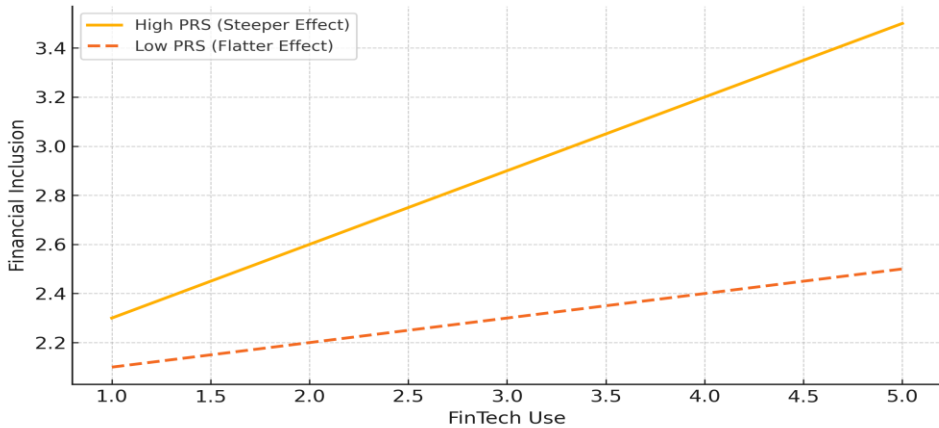


Figure 2. Perceived interaction between **FinTech Use** and **Financial Inclusion** under **Low vs. High Perceived Regulatory Support**. Source: the authors

As seen in **Figure 2**, the positive effect of FinTech use on Financial Inclusion strengthens when **Perceived Regulatory Support** is high. The slope increases from lower support (red) to higher support (green), indicating that **regulatory clarity reinforces the FinTech-inclusion pathway**, especially for digital microfinance users.

R² and Predictive Relevance

- **R² values** for the key endogenous constructs were:
 - **FinTech Use**: 53.5%

- **Digital Financial Literacy: 53.1%**
- **Financial Inclusion: 69.7%**

These values suggest a **substantial level of explanatory power**, particularly for financial inclusion outcomes.

- **Q² values (Stone–Geisser)** were also above zero:
 - FinTech Use: 0.527
 - Digital Financial Literacy: 0.499
 - Financial Inclusion: 0.527

This confirms that the model possesses **predictive relevance** (Hair et al., 2021).

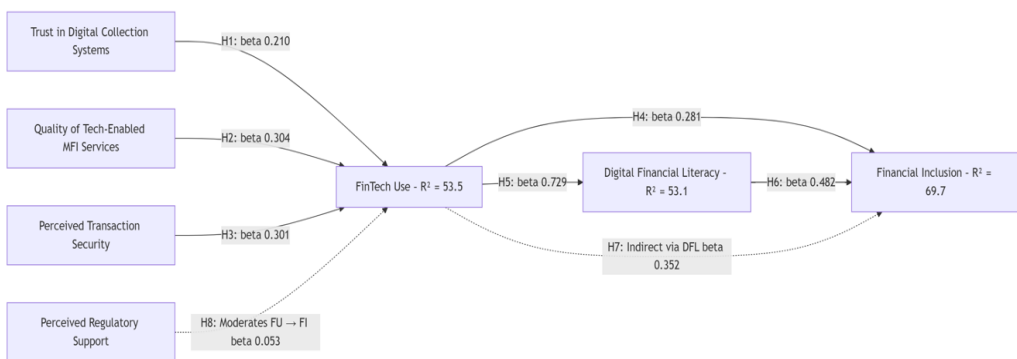


Figure 3. The empirical model. Source: the authors.

5. DISCUSSION

This study was undertaken with the objective of investigating how trust, service quality, and perceived security influence the adoption of digital collection mechanisms in Mumbai's microfinance ecosystem, and how such adoption, in turn, shapes digital financial literacy and financial inclusion. Additionally, this research examined the mediating role of digital financial literacy and the moderating role of perceived regulatory support in shaping the path from digital adoption to inclusion.

The empirical findings provide robust validation of several theoretical expectations. Firstly, trust in digital collection systems emerged as a significant predictor of adoption (H1). This aligns with the findings of Kumar et al. (2020) and Singh and Srivastava (2018), who argue that users' perceptions of institutional and platform-level reliability substantially influence willingness to engage with digital systems. In the context of microfinance, where the clientele often comprises financially

vulnerable individuals, the presence of trust acts as a buffer against perceived risk and unfamiliarity with technology-based platforms.

Secondly, quality of tech-enabled microfinance services was found to significantly impact adoption (H2), affirming insights from Zhou (2013) and George and Sunny (2023). The responsiveness of digital interfaces, the reliability of transaction execution, and the perceived relevance of platform features all contribute toward positive user experience, which facilitates continuous engagement. For the microfinance user base, this finding highlights the importance of contextualizing technology for ease-of-use, including vernacular interfaces and minimal friction processes.

Third, perceived transaction security also significantly influenced digital collection adoption (H3). This supports the conclusions drawn by Nasir et al. (2023) and George and Sunny (2023), who emphasize the criticality of user-perceived safeguards related to data privacy, authentication, and fraud protection. For low-income users engaging in digital microfinance, the assurance that their financial data and money are secure is a decisive factor in adoption decisions.

The study also validated the hypothesis that increased digital collection adoption fosters financial inclusion (H4). This observation is consistent with Arner et al. (2020) and Senyo and Osabutey (2020), who underline that the digitization of financial services bridges access gaps by removing location and process-based barriers. In the context of Mumbai's MFI customers, digital platforms helped increase transaction convenience, savings behavior, and access to digital credit products.

Furthermore, the results indicate that digital collection adoption positively enhances digital financial confidence (H5), which is consistent with the findings of Ravikumar et al. (2022). As users gain more exposure to digital interfaces and become familiar with transaction procedures, they build confidence in their ability to navigate these systems. Over time, this confidence translates into broader financial literacy, especially in environments where alternative financial education mechanisms are limited.

Correspondingly, digital financial literacy was found to significantly contribute to inclusive financial behavior (H6). This supports the earlier assertions by Kumar et al. (2023) and Panos and Wilson (2020), who state that digital literacy fosters autonomy in managing finances, enhances awareness of financial rights, and strengthens the ability to compare financial products. For MFI clients, this suggests that literacy-oriented adoption leads to greater engagement with savings, credit, and insurance products, not merely usage.

A key contribution of this study is its identification of a **mediating effect** of digital financial literacy in the relationship between FinTech adoption and financial inclusion (H7). While adoption facilitates access, it is the enhancement of financial understanding through usage that sustains inclusion. This mediating pathway highlights that without the necessary capabilities to interpret, act on, and benefit from digital services, inclusion remains superficial. This finding enriches the current body of literature by empirically validating a path that had hitherto been conceptually discussed but not statistically confirmed.

An important contextual layer to these findings is the alignment with the **Maharashtra FinTech Policy 2023**, which emphasizes inclusive digital finance through mobile infrastructure, Aadhaar-based KYC, and government-MFI collaborations. The observed significance of **Perceived Regulatory Support** corresponds with Mumbai's initiatives like the **Financial Access Councils** and **Urban Digital Literacy Missions**, which aim to build institutional credibility and bridge the urban digital divide. As such, confidence in regulatory frameworks emerges as not only a behavioral moderator but also a reflection of policy presence on the ground.

Lastly, this study finds support for the **moderating effect** of perceived regulatory support (H4a). The strength of the relationship between digital collection use and inclusive behavior is significantly enhanced when users believe that adequate regulatory safeguards exist. This finding resonates with Chandra et al. (2010) and aligns with the Indian regulatory landscape, where users' confidence in digital finance is often shaped by awareness of RBI directives, data protection norms, and grievance redressal channels. In environments like Mumbai, where financial literacy levels vary widely, perception of institutional legitimacy serves as a crucial confidence driver.

6. THEORETICAL IMPLICATIONS

This study contributes significantly to the evolving theoretical landscape of FinTech-enabled financial inclusion, particularly within the context of urban and peri-urban microfinance ecosystems. A key theoretical advancement lies in integrating **Digital Financial Literacy (DFL)** as a mediating construct in the relationship between digital collection adoption and inclusive financial behavior. While earlier models have addressed technology adoption using constructs from the Technology Acceptance Model (TAM) or Unified Theory of Acceptance and Use of Technology (UTAUT), this research underscores the necessity of inserting DFL as a cognitive and behavioral enabler that transforms mere access into meaningful financial inclusion.

Moreover, by validating **Trust**, **Perceived Security**, and **Service Quality** as antecedents to digital collection use, this study extends and supports prior works

(e.g., Kumar et al., 2020; Zhou, 2013) within a microfinance-specific digital setting. It reinforces the view that behavioral models in FinTech adoption must incorporate affective and cognitive antecedents alongside usability or infrastructure considerations.

Another important theoretical insight emerges from the **moderating role of Perceived Regulatory Support (PRS)**. Existing models often treat the regulatory environment as a contextual background. However, this study positions PRS as a **contextual amplifier**, one that strengthens or weakens the digital-to-inclusion pathway. This addition prompts a rethinking of how policy trust and institutional credibility intersect with user psychology in emerging digital financial systems.

Together, these theoretical contributions call for a reframing of digital financial inclusion models, from linear, access-oriented frameworks to **multi-layered behavioral ecosystems**, where literacy, institutional confidence, and technology co-evolve to generate meaningful inclusion outcomes.

7. PRACTICAL IMPLICATIONS

The findings carry strong implications for **FinTech platforms, MFIs, policymakers, and financial educators** seeking to foster inclusion through digital mechanisms.

First, the role of **trust** and **security** cannot be overstated. For FinTech providers and microfinance institutions (MFIs), this necessitates ongoing investment in visible security protocols (e.g., two-factor authentication, secure payment confirmations) and **transparent communication strategies** to build user confidence, particularly among first-time and low-income digital users.

Second, **service quality** emerged as a strong determinant of adoption. This implies that platforms should focus on frictionless interfaces, multilingual accessibility, and responsive customer support. Tailoring platform design for users with low digital familiarity can be a differentiator in user retention and deeper engagement.

Third, the results highlight the **transformational potential of Digital Financial Literacy (DFL)**. FinTech providers should consider embedding **DFL toolkits** within their platforms, such as gamified modules, local-language videos, and usage tips, to transform passive users into informed, empowered participants. Collaborations with government bodies or civil society can further extend the reach of these educational interventions.

Fourth, **regulatory clarity** plays a catalyzing role. Policymakers must ensure **easy-to-understand, user-visible regulatory frameworks** (e.g., grievance redress mechanisms, data privacy laws, dispute handling). Regulatory bodies should explore mass awareness campaigns, particularly in urban low-income clusters, highlighting user rights, protections, and safety nets when using FinTech.

Lastly, **regular impact monitoring** by stakeholders, on both adoption behavior and inclusion outcomes, can help recalibrate digital strategies. Designing inclusive digital journeys, especially for the underbanked and underserved, will require ongoing iteration and dialogue between regulators, platforms, and community financial actors.

8. LIMITATIONS AND FUTURE SCOPE OF THE STUDY

First, the research employed **non-probabilistic convenience sampling** due to the unavailability of a verified database of digital microfinance users. Although this allowed broader reach, it limits the representativeness of the findings. Second, the focus on **Greater Mumbai and Extended MMR** may constrain geographic generalizability. Regional variation in FinTech infrastructure, MFI penetration, and user exposure may produce differing outcomes elsewhere.

Third, the study did not explicitly investigate **individual-level psychological traits**, such as risk aversion, technology anxiety, or openness to change, each of which may influence the digital inclusion trajectory.

Future research could address these limitations through multiple pathways:

- **Qualitative studies** (e.g., in-depth interviews, ethnographic studies) may uncover nuanced user experiences and behavioral barriers not visible in structured surveys.
- **Segmented analysis** based on age, income level, gender, and education could reveal digital inclusion disparities within MFI user groups.
- Further exploration of **service-specific FinTech platforms** (e.g., peer-to-peer lending, micro-insurance apps) could help identify which offerings are most impactful for inclusion.
- Larger, multi-city studies using **probability-based samples** would enhance the external validity and policy relevance of future findings.

In addition to non-probability sampling, future studies should account for **gendered dimensions of DFL**, particularly among urban women MFI borrowers who may be underrepresented in digital usage data. Moreover, the long-term effect of the **RBI's**

2023 digital lending reforms on user trust and FinTech loyalty deserves longitudinal investigation. Finally, qualitative explorations, such as ethnographic or in-depth interviews, can yield richer insights into lived experiences of digital financial behavior.

Lastly, the evolving regulatory landscape, especially around **data protection**, **digital lending norms**, and **financial grievance frameworks**, offers fertile ground for future longitudinal studies on trust and regulatory perception dynamics.

9. CONCLUSIONS

This study advances the understanding of digital financial inclusion within Mumbai's microfinance landscape by examining how FinTech platforms interact with behavioral enablers. It confirms that trust, service quality, and perceived transaction security are critical antecedents of digital collection adoption, highlighting that access to technology is insufficient without supportive psychological and institutional conditions.

FinTech usage was found to positively impact financial inclusion by reducing barriers, lowering costs, and offering transparency compared to traditional channels. However, the study's key insight lies in identifying **digital financial literacy** as a mediating variable, demonstrating that digital access only leads to inclusion when users are equipped with the competencies to engage meaningfully with FinTech tools.

Furthermore, **perceived regulatory support** plays a vital moderating role, strengthening user confidence in FinTech systems when the regulatory environment is viewed as credible and protective. Such perceptions foster trust in data protection, grievance mechanisms, and institutional accountability.

By integrating these behavioral and regulatory dimensions into a unified empirical model, this research reframes financial inclusion not merely as digital access, but as a function of **adoption, capability, and confidence**, situated within a supportive ecosystem.

The study contributes conceptually to digital finance literature and offers practical guidance for policymakers, FinTech providers, and microfinance institutions seeking to develop inclusive and resilient digital financial ecosystems.

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