Digital financial inclusion beyond repayment: trust, task diversity and borrower autonomy in Indian microfinance

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Abstract: *Purpose - This paper examines whether participation in digital microfinance transactions translates into broader borrower capability, and whether technology-acceptance, trust, risk and enabling conditions are associated with behavioural intention.*

Design/methodology/approach - The supplied cross-sectional survey file for Ranchi district, Jharkhand, India was audited before analysis. It contains 662 complete respondent records. Composite scores were formed from 29 five-point Likert items. The analysis uses task-level descriptive statistics, Cronbach's alpha, a paired-samples test of institutional versus technological trust, HC3-robust OLS, variance inflation factors and an unweighted sensitivity analysis based on unique multivariate response profiles.

Findings - Balance inquiry (96.1%) and loan repayment (87.9%) were common, while fund transfer (55.7%), bill payment (36.0%) and new digital loan application (16.0%) were less prevalent. The repayment-transfer difference was 32.2 percentage points. Trust in the MFI ($M = 4.37$) exceeded trust in technology ($M = 3.38$), with a paired mean difference of 1.00 point ($p < .001$). In the full-file HC3 model, several constructs were statistically associated with behavioural intention, but severe multicollinearity and exact repetition of response profiles materially limit coefficient-level inference. In the unique-profile sensitivity analysis, perceived financial benefit, social influence and facilitating conditions retained positive associations at the 5% level.

Practical implications - MFIs and regulators should evaluate digital inclusion with measures of task diversity, independent initiation, authentication, security and error recovery, rather than relying on electronic repayment volumes alone. Data-quality controls are equally important when borrower-level evidence is used for policy inference.

Originality/value - The paper separates institutional digitisation from borrower-level financial agency through the Compliance-Autonomy Gap and the Trust-Enabled Phygital Adoption Framework (TEPAF). It also demonstrates how file-level integrity checks and sensitivity analysis can change the interpretation of highly fitted technology-adoption models.

Keywords: Digital Financial Inclusion; Microfinance; Borrower Autonomy; Digital Literacy; Trust; Financial Technology; Data Quality

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JEL classification: G21, G23, G28, O16, O33

Introduction

Digital payment infrastructure has expanded rapidly in India, but the policy meaning of high transaction volumes depends on what users can actually do with the infrastructure. This issue is particularly important in microfinance, where digital channels are often introduced through pre-existing relationships with field officers, group meetings and regulated non-bank lenders. Electronic repayment can reduce cash-handling costs, improve traceability and accelerate reconciliation for financial institutions, yet a transaction may remain heavily prompted or completed with assistance at the borrower level. The distinction between institutional digitisation and user capability is therefore material to financial inclusion policy.

India's policy environment increasingly emphasises not only access but also responsible digital finance. The Reserve Bank of India (RBI) has reported continuing gains in financial inclusion and digital-payment infrastructure, while the Digital Lending Directions, 2025 strengthen expectations concerning disclosures, data governance, lender-service-provider arrangements and grievance redressal (Reserve Bank of India, 2025a, 2025b, 2025c, 2026). These developments make it necessary to ask whether digital expansion is producing independent and recoverable use among low-income customers, rather than simply transferring institutional processes from cash to electronic channels.

The present study addresses that issue using the supplied survey file for active microfinance borrowers in Ranchi district, Jharkhand. After file-level validation, 662 complete records are available for analysis. The central research question is: what does a digitally recorded transaction reveal about the borrower's capacity to initiate, understand, secure and recover from financial activity? The paper defines the Compliance-Autonomy Gap as the difference between digitally mediated activity that is closely tied to an institutional requirement and digital financial activity undertaken for more discretionary, self-directed purposes. The concept does not treat assisted use as inferior; assistance may be an effective entry mechanism. The policy concern arises when assisted or prescribed use is counted as mature digital inclusion without observing who decides, enters information, authenticates the transaction, interprets the result and responds to failure.

The study makes three contributions relevant to financial economic policy. First, it separates digital participation from digital financial autonomy and therefore challenges transaction volume as a complete proxy for capability. Second, it distinguishes trust in the microfinance institution from trust in the technology, recognising that relationship-based confidence may support initial adoption without automatically transferring to the digital system. Third, it develops the Trust-Enabled Phygital Adoption Framework (TEPAF), which treats human intermediation as a potential learning scaffold through which supported use can progress toward independent and safer financial action. These contributions link behavioural finance, financial inclusion and consumer-protection concerns to the digital transformation of microfinance institutions.

The remainder of the paper is structured as follows. Section 2 presents the underpinning theories and conceptual framework. Section 3 reviews the empirical literature and develops the hypotheses. Section 4 describes the methodology. Section 5 reports and discusses the empirical findings. Section 6 sets out policy implications, limitations and conclusions.

Underpinning theories and conceptual framework

2.1 Technology acceptance and behavioural intention

The Technology Acceptance Model (TAM) explains technology acceptance mainly through perceived usefulness and perceived ease of use (Davis, 1989). In the supplied instrument, the usefulness-related dimension is operationalised as Perceived Financial Benefit (PFB): the extent to which digital finance is regarded as economically or practically advantageous. Perceived ease of use (PEOU) captures the effort required to understand and operate the service. Reviews of digital-finance adoption continue to identify usefulness-related benefits and ease of use as important, although their effects vary across user groups and technologies (Bhowal & Shil, 2026; Kajol et al., 2022).

For microfinance borrowers, perceived financial benefit is not equivalent to autonomy. A repayment channel may be beneficial because it saves travel or satisfies a lending obligation, even when the borrower would not independently initiate another digital financial service. TAM therefore remains useful for explaining perceived value and willingness to use technology, but it does not by itself distinguish institutionally induced use from self-directed financial action.

2.2 UTAUT, social influence and facilitating conditions

The Unified Theory of Acceptance and Use of Technology (UTAUT) extends technology-acceptance research by incorporating performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al., 2003). This perspective is especially relevant in financially constrained settings because actual use depends on social and material conditions. Family members, peers, field agents, device access, connectivity, electricity and service support can all influence whether a borrower can transact independently.

The same facilitating environment can support or constrain autonomy. Social support can reduce uncertainty and encourage first use, but it may also preserve dependency if another person routinely completes key transaction steps. The policy question is therefore not whether assistance exists, but whether support progressively transfers competence to the user.

2.3 Institutional trust, technological trust and perceived risk

Trust is central to digital finance because users face uncertainty about system reliability, privacy, security, transaction accuracy and remedies after failure. Trust in an institution and trust in a technological system are related but conceptually distinct (McKnight et al., 2002). In relationship-based microfinance, confidence in a familiar MFI can develop through repeated meetings and predictable procedures. Technological trust requires confidence that the system will execute transactions correctly, protect credentials and provide an intelligible route to resolution when something goes wrong.

Perceived risk represents the expectation of undesirable outcomes such as monetary loss, fraud, privacy exposure, failed transactions or difficulty reversing an error. Indian evidence links trust and perceived risk to adoption of digital financial services and shows that intermediaries remain important for many users (Jacob et al., 2024; Kumar et al., 2023; Yadav & Kalluru, 2024). This study therefore separates Trust in MFI (TMFI), Trust in Technology (TTEC) and Perceived Risk (PR).

2.4 Digital literacy, capability and agency

Digital literacy extends beyond smartphone ownership. It includes navigating interfaces, interpreting transaction information, protecting credentials, identifying suspicious requests and responding to errors. Financial skills and digital literacy have been associated with mobile payment and banking intention (Ullah et al., 2022), while broader research links digital financial skills to human-development outcomes (Sharma & Díaz Andrade, 2023).

A capability-sensitive view shifts the unit of analysis from what a platform offers to what a user can actually do. Repeated repayment through one prescribed channel can generate familiarity with a narrow procedure without producing transferable competence. Independent balance checking, bill payment, transfer initiation, beneficiary verification, digital borrowing and grievance filing require different combinations of knowledge, judgement and authentication. Error recovery is also substantive: inclusion is weaker when a user cannot interpret a pending transaction, preserve a reference number or invoke the correct complaint channel.

2.5 Compliance-Autonomy Gap and multidimensional financial agency

The Compliance-Autonomy Gap is defined here as the difference between digitally mediated transactions completed because they are institutionally expected and digital financial activities undertaken independently for self-directed financial management. Repayment may become digital because an MFI changes its collection process. The transaction is electronic, but the borrower may remain dependent on staff, agents or family members to initiate or complete it. Autonomous use involves identifying a financial need, selecting a service, initiating and authenticating the transaction, understanding the outcome and knowing how to respond if it fails.

To make the distinction measurable, the study proposes six analytical dimensions: access, assisted execution, independent initiation, transaction diversity, protective capability and error-recovery capability. These dimensions do not form a deterministic ladder and are not estimated as latent variables in the present dataset. Their purpose is measurement discipline: assessments should identify which capability is present instead of compressing all digital behaviour into a user/non-user classification.

Table 1. Multidimensional architecture of borrower digital financial autonomy

Dimension	Core question	Illustrative borrower-level indicator
Access	Can the borrower reach the service?	Device, account, network or service point available
Assisted execution	Can the task be completed with help?	Completes transaction with staff, agent or family guidance

Dimension	Core question	Illustrative borrower-level indicator
Independent initiation	Can the borrower start and authenticate unaided?	Initiates and authenticates without routine assistance
Transaction diversity	Does competence transfer across tasks?	Uses multiple discretionary digital financial functions
Protective capability	Can the borrower prevent avoidable harm?	Protects PIN/OTP, verifies recipient and recognises suspicious requests
Error-recovery capability	Can the borrower act when something goes wrong?	Checks status, preserves reference and follows grievance process

Note. The dimensions are conceptual propositions for future scale development and were not estimated as latent variables in the present dataset.

Empirical literature review and hypotheses

3.1 Evidence on digital finance adoption

Empirical studies of mobile payments and digital financial services broadly support the relevance of usefulness-related benefits, ease of use, social influence and facilitating conditions. In India, Patil et al. (2020) identify personal, trust and grievance-related factors in mobile payment adoption; Nandru et al. (2023) and Linge et al. (2023) show the importance of enabling conditions; and Jacob et al. (2024) report positive roles for performance and effort expectations and a negative association between perceived risk and UPI intention among low-income consumers. Review evidence likewise emphasises trust, risk and contextual barriers (Kajol et al., 2022; Neves et al., 2023).

The literature nevertheless has two limitations for the present policy question. First, adoption is commonly treated as a single outcome even though digital tasks differ in discretion, complexity and required agency. Process-oriented work increasingly recognises that adoption develops over time and across practices (Naeem et al., 2022; Chamboko, 2024). Second, evidence from high-volume payment ecosystems can encourage an ecological inference from infrastructure success to user capability. National payment growth establishes an opportunity structure, but it does not establish that low-income borrowers can independently initiate, verify and recover transactions.

3.2 Trust, risk and the microfinance setting

Microfinance intensifies the distinction because digital services are often embedded in a physical service network. Field officers, group meetings and local agents can lower entry barriers and create trust, while simultaneously making it difficult to distinguish the borrower's own competence from assisted execution. Evidence on principal-agent trust in Indian digital finance supports the continuing importance of intermediary relationships (Yadav & Kalluru, 2024). The question is whether institutional trust acts as a bridge to technological trust and independent use or becomes a stable substitute for it.

The study therefore treats transaction type, institutional trust and technological trust as analytically separate. It also interprets perceived risk and facilitating conditions as policy-

relevant because consumer protection and infrastructure affect whether users can safely convert access into purposeful financial action.

3.3 Research gap, objectives and hypotheses

The literature establishes important antecedents of digital adoption but provides less evidence on the gap between institutionally supported use and borrower autonomy in relationship-based finance. This study addresses that gap by combining a task-level descriptive comparison with a conventional technology-acceptance model and a borrower-centred interpretation of digital capability. The objectives are to assess the form of digital financial use among active microfinance borrowers, test reported associations between adoption constructs and behavioural intention, distinguish institutional from technological trust, and derive policy implications for the transition from assisted to more autonomous use.

1. H1: Perceived financial benefit is positively associated with behavioural intention to use digital financial services.
2. H2: Perceived ease of use is positively associated with behavioural intention.
3. H3: Digital literacy is positively associated with behavioural intention.
4. H4: Trust in the microfinance institution is positively associated with behavioural intention.
5. H5: Trust in technology is positively associated with behavioural intention.
6. H6: Perceived risk is negatively associated with behavioural intention.
7. H7: Social influence is positively associated with behavioural intention.
8. H8: Facilitating conditions are positively associated with behavioural intention.

Methodology

4.1 Research design, setting and sampling

The study uses a quantitative cross-sectional design focused on active microfinance borrowers in Ranchi district, Jharkhand, India. The original research design describes data collection through Joint Liability Group centre meetings in Kanke, Namkum and Ratu using computer/tablet-assisted personal interviews in locally understandable languages. For the present data-aligned revision, inference is restricted to what can be verified from the supplied workbook.

The workbook contains 662 complete respondent rows. The identifier sequence runs from 1 to 663 with Respondent_ID 407 absent; all remaining identifiers are unique. No missing cells were detected in the 43 supplied variables. All 29 Likert items fall within the intended 1-5 range and all six task-use indicators are binary (0/1). The mean age is 38.06 years (SD = 11.03; range = 21-63). A substantive codebook for the categorical demographic codes was not supplied, so this revision does not attach unverified labels to gender, education, occupation, tenure, usage-duration or usage-frequency codes.

4.2 Measures

The questionnaire file contains four Digital Literacy items (DL1-DL4), three Perceived Ease of Use items (PEOU1-PEOU3), four Perceived Financial Benefit items (PFB1-PFB4), three Trust in MFI items (TMFI1-TMFI3), three Trust in Technology items (TTEC1-TTEC3), three

Perceived Risk items (PR1-PR3), three Social Influence items (SI1-SI3), three Facilitating Conditions items (FC1-FC3) and three Behavioural Intention items (BI1-BI3). Composite scores are calculated as the arithmetic mean of each construct's items. Internal consistency is assessed using Cronbach's alpha.

4.3 Data integrity checks and analytical strategy

A second file-level check examined whether each row represented a distinct multivariate response pattern. Excluding Respondent_ID, the 662 rows collapse to 99 unique exact profiles, and one profile appears 20 times. Because the workbook does not contain a duplication flag, centre identifier or other field that can establish whether these repetitions are legitimate independent respondents, the analysis does not silently delete them. Instead, the full supplied file is retained for descriptive reporting and a unique-profile sensitivity analysis is used to show how inference changes when each exact profile receives equal weight.

The main regression estimates behavioural intention as BI_i = alpha + beta1 PFB_i + beta2 PEOU_i + beta3 DL_i + beta4 TMFI_i + beta5 TTEC_i + beta6 PR_i + beta7 SI_i + beta8 FC_i + epsilon_i. Heteroscedasticity-consistent HC3 standard errors are reported. Variance inflation factors (VIFs) are used to diagnose collinearity, and the same model is re-estimated on the 99 unique response profiles as a sensitivity check.

The diagnostics require substantial caution. The full-file model has R-squared = .985, but several predictor correlations exceed |.95| and VIFs range from 1.86 to 86.89. The Breusch-Pagan test is significant (LM = 168.55, $p < .001$), confirming heteroscedasticity in the conventional OLS residuals. HC3 standard errors address heteroscedasticity but do not solve multicollinearity or uncertain record independence. Coefficients are therefore treated as exploratory associations rather than estimates of unique causal effects.

Two borrower-autonomy contrasts are calculated directly from the supplied data. The Compliance-Autonomy Gap is operationalised as the difference between reported digital loan repayment and fund-transfer use. Trust asymmetry is examined with the paired difference between TMFI and TTEC composite scores. National indicators from the RBI, National Payments Corporation of India (NPCI) and Micro Finance Industry Network (MFIN) remain contextual evidence only and are not merged with the respondent-level file.

Results and discussion

5.1 Data integrity and digital task concentration

The data audit changes the empirical basis of the manuscript in two important ways. First, the supplied workbook supports an analytic N of 662 rather than 663. Second, the presence of 99 unique exact multivariate profiles among 662 rows means that conventional row-level standard errors can be too optimistic if repeated profiles do not represent genuinely independent respondents. Table 2 therefore reports both integrity checks and the digital task-use rates calculated directly from the file.

Table 2. Data integrity audit and digital-use profile

Indicator	Result
Analytic records	662 complete rows
Respondent identifier check	IDs 1-663; ID 407 absent
Missing cells in supplied variables	0
Likert-item range check	All 29 items within 1-5
Task-indicator range check	All six indicators within 0-1
Unique exact multivariate profiles	99 of 662 records
Maximum exact profile repetition	20 records
Age	M = 38.06, SD = 11.03; range = 21-63
Balance inquiry	96.1%
Loan repayment	87.9%
Information/services	79.8%
Fund transfer	55.7%
Bill payment	36.0%
New loan application	16.0%
Repayment-transfer gap	32.2 percentage points

Note. Percentages are calculated from the 662 supplied respondent rows. Exact-profile counts exclude Respondent_ID. A substantive codebook for categorical demographic codes was not supplied.

Digital activity is broadest for balance inquiry (96.1%), followed by loan repayment (87.9%) and information/services (79.8%). More discretionary or consequential tasks are less common: 55.7% report fund transfer, 36.0% bill payment and 16.0% a new digital loan application. The repayment-transfer difference is 32.2 percentage points. This is materially smaller than the gap reported in the earlier manuscript version, but it still shows that usage is task-specific rather than uniform across digital financial functions.

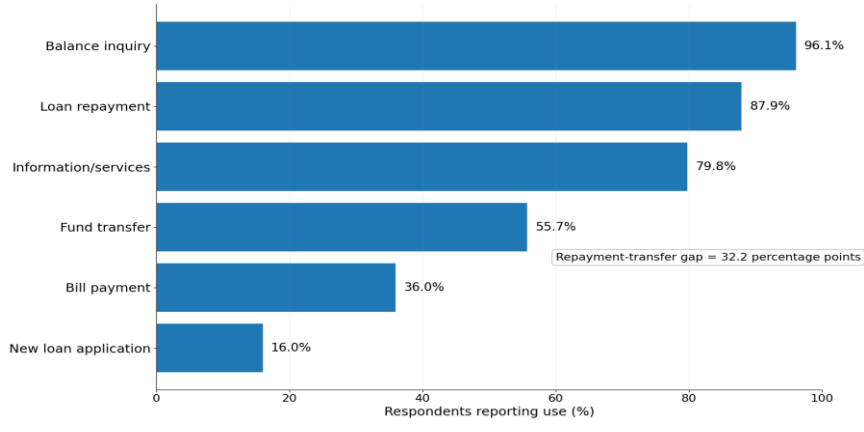

Figure 1. Reported use of digital financial activities in the supplied dataset

Source: Author's analysis of the supplied survey file (N = 662).

5.2 Construct reliability, trust asymmetry and borrower perceptions

Table 3. Construct-level descriptive statistics, reliability and association with behavioural intention

Construct	k	M	SD	α	r(BI)
DL	4	3.153	1.289	.968	.961
PEOU	3	3.705	1.079	.931	.980
PFB	4	3.577	1.186	.955	.972
TMFI	3	4.374	0.494	.704	-.507
TTEC	3	3.377	1.157	.946	.972
PR	3	2.791	1.240	.954	-.973
SI	3	3.352	1.238	.950	.979
FC	3	3.851	1.154	.936	.979
BI	3	3.549	1.383	.984	-

Note. DL = digital literacy; PEOU = perceived ease of use; PFB = perceived financial benefit; TMFI = trust in MFI; TTEC = trust in technology; PR = perceived risk; SI = social influence; FC = facilitating conditions; BI = behavioural intention. All composites use five-point item responses. α is Cronbach's alpha; r is the Pearson correlation with BI.

Trust in the MFI is the highest-rated construct (M = 4.37, SD = 0.49), whereas trust in technology is lower (M = 3.38, SD = 1.16). With respondent-level data available, the difference can now be tested directly: the paired mean gap is 0.997 points, $t(661) = 17.38$, $p < .001$, with Cohen's $d_z = 0.68$. The result supports a meaningful distinction between confidence in a familiar institution and confidence in the digital system through which services are delivered.

Internal consistency is acceptable for TMFI (alpha = .704) and very high for the other constructs (alpha = .931-.984). Very high alpha values can indicate strong coherence, but they can also signal redundant item content. The bivariate pattern is similarly concentrated: PEOU, PFB, TTEC, SI and FC each correlate with behavioural intention at approximately r = .97-.98, while perceived risk correlates at r = -.973. These magnitudes explain why unique coefficient effects are difficult to identify in a simultaneous regression.

5.3 HC3 regression, multicollinearity and sensitivity analysis

Table 4. Behavioural intention: HC3-robust OLS and unique-profile sensitivity analysis

Predictor	B	HC3 SE	p	VIF	Sensitivity B (p)
PFB	.288	.036	< .001	35.05	.342 (.001)
PEOU	.189	.046	< .001	45.82	.213 (.095)
DL	.139	.049	.004	59.55	.152 (.278)
TMFI	.065	.019	.001	1.86	.060 (.223)
TTEC	-.261	.061	< .001	80.41	-.256 (.145)

Predictor	B	HC3 SE	p	VIF	Sensitivity B (p)
PR	-.260	.062	< .001	86.89	-.215 (.177)
SI	.248	.030	< .001	37.38	.259 (.004)
FC	.313	.046	< .001	55.88	.266 (.049)

Note. Dependent variable: BI. B coefficients are unstandardised. Full-file model: N = 662, R-squared = .985, adjusted R-squared = .985. Sensitivity model: n = 99 unique exact response profiles, R-squared = .983. VIF values above 10 indicate severe multicollinearity; results are provisional pending verification of the original survey export.

In the full supplied file, PFB, PEOU, digital literacy, TMFI, social influence and facilitating conditions have positive coefficients with HC3 p values below .01, whereas perceived risk and TTEC have negative coefficients. Those p values should not be interpreted in isolation. VIFs exceed 35 for six predictors and exceed 80 for TTEC and perceived risk. When exact multivariate repeats are collapsed so that each of the 99 unique profiles receives equal weight, PFB (B = .342, p = .001), social influence (B = .259, p = .004) and facilitating conditions (B = .266, p = .049) retain positive associations at the 5% level. PEOU remains positive but falls to p = .095; the remaining coefficients no longer reach the 5% threshold.

The negative coefficient on trust in technology is not a sound basis for claiming that technological trust reduces adoption. TTEC is extremely collinear with perceived risk and several other acceptance constructs; the absolute correlation between TTEC and perceived risk is about .986, and the VIF for TTEC is 80.41. The sign is therefore vulnerable to suppression. The sensitivity analysis also renders the TTEC coefficient statistically non-significant. The safer interpretation is that the supplied measurement structure does not separate technological trust, perceived risk and the other acceptance constructs well enough for a stable unique-effect claim.

The hypothesis assessment is consequently evidence-weighted rather than mechanical. H1, H7 and H8 receive the clearest support because PFB, social influence and facilitating conditions remain significant in the unique-profile analysis. H2 receives weaker support because the PEOU effect is sensitive to the treatment of repeated profiles. H3, H4 and H6 are directionally consistent in the full-file model but not robust to the sensitivity check. H5 is not supported because the TTEC coefficient is negative and unstable under severe collinearity.

5.4 From adoption to autonomy: interpretation of the findings

Taken together, the findings support a distinction between adoption intensity and autonomy depth, but the contrast is more nuanced than in the earlier manuscript version. Repayment is common, yet transfer, bill payment and new-loan activity are markedly less prevalent. The 32.2-point repayment-transfer difference indicates that a borrower's experience with one institutionally salient digital task does not imply equivalent use across other financial functions. The policy question therefore remains which tasks are performed, how much discretion they involve and who controls the transaction process.

The regression evidence points most consistently to perceived financial benefit, social influence and facilitating conditions. This is compatible with technology-acceptance and UTAUT reasoning: borrowers are more likely to express intention when digital finance offers tangible value, when relevant social actors support its use and when the surrounding infrastructure and assistance make it workable. Perceived risk remains negatively related to intention at the bivariate and full-model levels, but the severe overlap with technological trust means that separate unique effects cannot be claimed confidently (Jacob et al., 2024; Kumar et al., 2023). The national context illustrates why infrastructure depth should be distinguished from autonomy depth. RBI's Digital Payments Index rose from 349.30 in March 2022 to 516.76 in September 2025, and the Financial Inclusion Index increased from 64.2 in March 2024 to 67.0 in March 2025. NPCI reported 22,716.07 million UPI transactions worth INR 28,92,138.67 crore in June 2026. At the same time, MFIN reported a microfinance industry portfolio of INR 4,33,697 crore in March 2024, INR 3,75,030 crore in March 2025 and INR 3,25,174 crore in March 2026, followed by a sequential rise to INR 3,28,708 crore in June 2026 (Micro Finance Industry Network, 2024, 2025, 2026a, 2026b; National Payments Corporation of India, 2026; Reserve Bank of India, 2025c, 2026). These macro and sector indicators are contextual rather than respondent-level evidence.

For financial policy, the implication is twofold. Aggregate payment growth should be complemented by borrower-level evidence on independent initiation, task diversity, security behaviour and grievance capability. At the same time, micro-level policy claims require auditable respondent files with credible independence and traceable sampling identifiers. Digital-inclusion metrics are only as reliable as the transaction and survey records from which they are constructed.

5.5 Trust-Enabled Phygital Adoption Framework

The results and theoretical literature support a staged interpretation of digital microfinance adoption. TEPAF proposes five conceptual states: institutional compliance, assisted digital use, familiarity and confidence, independent digital use and broader financial autonomy. Institutional trust can facilitate first exposure; guided practice can create procedural familiarity; successful and recoverable transactions can strengthen technological confidence; and confidence combined with competence can support independent use. Perceived risk can interrupt the transition, while effective facilitating conditions and grievance redress can stabilise it. The stages are conceptual propositions, not statistically estimated latent states.

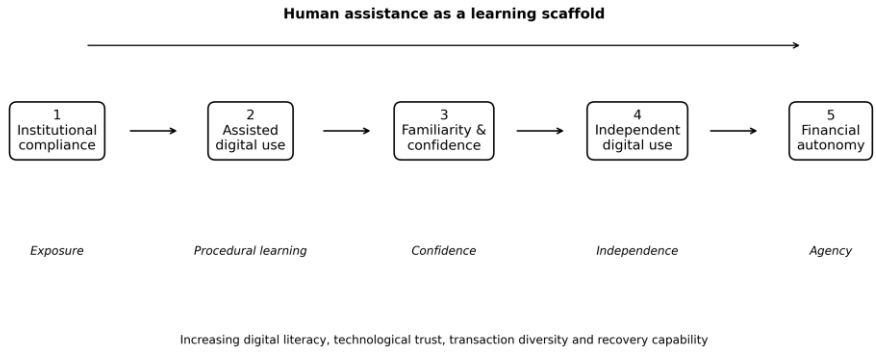

Figure 2. Trust-Enabled Phygital Adoption Framework (TEPAF)

Source: Author's conceptualisation. The stages are conceptual and were not statistically estimated in this study.

TEPAF differs from a conventional TAM extension because it does not treat all digital transactions as behaviourally equivalent. Human assistance is not automatically evidence of failed adoption. When it functions as a learning scaffold, assistance can help borrowers move from exposure to competence. The strategic objective is therefore not to eliminate field support immediately, but to make routine assistance progressively less necessary while keeping a reliable safety net for errors and complaints.

Policy implications and conclusion

6.1 Policy implications

First, MFIs and regulators should measure borrower autonomy alongside digital transaction volume. Useful indicators include whether the borrower independently initiates and authenticates transactions, uses more than one discretionary digital financial function, verifies counterparties, checks transaction status and knows the official grievance route. A digital inclusion dashboard based only on electronic repayment rates can overstate capability.

Second, field staff should be repositioned as digital-learning intermediaries. Rather than routinely completing transactions on behalf of borrowers, staff can demonstrate the process, allow the borrower to perform subsequent steps and remain available as a safety net. This preserves the trust advantages of relationship-based microfinance while progressively transferring control to the user.

Third, service design should treat low literacy and vernacular use as design conditions. Interfaces should minimise unnecessary text, use familiar terminology and provide clear confirmation of amount, recipient, status and transaction reference. Complaint registration, tracking, reversal and escalation processes should be visible and understandable. These measures align the quality of digital inclusion with the consumer-protection orientation of the RBI's Digital Lending Directions, 2025 (Reserve Bank of India, 2025b).

Fourth, cybersecurity should be integrated with financial capability rather than delivered only as generic warnings. Borrowers need practical competence in protecting PINs and authentication codes, identifying suspicious requests, checking whether an application is linked to a legitimate regulated entity and preserving evidence when fraud or failure occurs. The relevant policy outcome is informed and recoverable autonomy, not maximum digitisation for its own sake.

6.2 Limitations and future research

Several limitations qualify the evidence. The design is cross-sectional, the setting is confined to active borrowers in Ranchi district and task use is self-reported. More importantly, the supplied analysis workbook contains only 99 unique exact multivariate response profiles among 662 rows. Without the original survey export, centre identifiers or a documented explanation for repeated profiles, record independence cannot be established. Severe multicollinearity further weakens coefficient-level interpretation. The Compliance-Autonomy Gap and TEPAF are conceptual contributions rather than validated measurement scales. The regression should therefore be regarded as provisional until the source data are reconciled and the measurement model is re-validated.

Future work should first reconcile the analytic workbook with the original CAPI export and sampling records. Once record independence is verified, a measurement model should test convergent and discriminant validity before structural relationships are estimated. Research should also distinguish account ownership from actual transaction performance and record who decides, initiates, authenticates and resolves each task. A Borrower Digital Autonomy Index could then operationalise independent initiation, transaction diversity, protective capability and error recovery. Longitudinal designs could test whether reliance on intermediaries declines as repeated successful and recoverable transactions increase technological confidence.

6.3 Conclusion

Digitalisation in microfinance should not be evaluated solely by whether a transaction has become electronic. In the supplied dataset, 87.9% of respondents report digital repayment compared with 55.7% reporting fund transfer, a 32.2 percentage-point difference. Balance inquiry is even more common at 96.1%, while bill payment and new digital loan applications remain much less prevalent. Trust in the MFI exceeds trust in technology by about one point, and that difference is statistically large in the paired comparison. These results continue to support the distinction between relationship-based participation and broader digital capability. The policy message is therefore conditional but useful. India's digital-payment infrastructure creates the opportunity for inclusion; meaningful borrower capability additionally depends on whether users can initiate, understand, secure and recover digital transactions across more than one task. The most stable behavioural correlates in the sensitivity analysis are perceived financial benefit, social influence and facilitating conditions. Before stronger causal or hypothesis-level claims are made, however, the respondent file should be verified against the original survey records. Well-designed human support can remain a bridge toward autonomy, but rigorous data governance is equally necessary if financial policy is to be based on borrower-level evidence.

References

Amnas, M. B., Selvam, M., & Parayitam, S. (2024). FinTech and financial inclusion: Exploring the mediating role of digital financial literacy and the moderating influence of perceived regulatory support. Journal of Risk and Financial Management, 17(3), 108. https://doi.org/10.3390/jrfm17030108

Bhowal, P., & Shil, P. (2026). Exploring FinTech adoption: A systematic literature review on user acceptance. Telematics and Informatics Reports, 22, 100343. https://doi.org/10.1016/j.teler.2026.100343

Chamboko, R. (2024). Digital financial services adoption: A retrospective time-to-event analysis approach. Financial Innovation, 10, 46. https://doi.org/10.1186/s40854-023-00568-1

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340.

Ha, D., Le, P., & Nguyen, D. K. (2025). Financial inclusion and fintech: A state-of-the-art systematic literature review. Financial Innovation, 11, 69. https://doi.org/10.1186/s40854-024-00741-0

Jacob, R. C., Jacob, M. E., & Johnson, J. (2024). Understanding factors affecting UPI adoption among low-income consumers in India. Indian Journal of Finance, 18(7), 44-59. https://doi.org/10.17010/ijf/2024/v18i7/174032

Kajol, K., Singh, R., & Paul, J. (2022). Adoption of digital financial transactions: A review of literature and future research agenda. Technological Forecasting and Social Change, 184, 121991. https://doi.org/10.1016/j.techfore.2022.121991

Kumar, R., Singh, R., Kumar, K., Khan, S., & Corvello, V. (2023). How does perceived risk and trust affect mobile banking adoption? Evidence from India. Sustainability, 15(5), 4053. https://doi.org/10.3390/su15054053

Linge, A. A., Chaudhari, T., Kakde, B. B., & Singh, M. (2023). Analysis of factors affecting use behavior towards mobile payment apps: A SEM approach. Human Behavior and Emerging Technologies, 2023, 3327994. https://doi.org/10.1155/2023/3327994

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. Information Systems Research, 13(3), 334-359. https://doi.org/10.1287/isre.13.3.334.81

Micro Finance Industry Network. (2024). Microfinance loan portfolio stands at INR 4,33,697 crores as on March 31, 2024: Micrometer Q4 FY 2023-24. https://mfinindia.org/NewsEvent/pressreleases

Micro Finance Industry Network. (2025). Micrometer Q4 FY 2024-25: Industry position as on March 31, 2025. https://mfinindia.org/NewsEvent/pressreleases

Micro Finance Industry Network. (2026a). Micrometer Q4 FY 2025-26: Industry position as on March 31, 2026. https://mfinindia.org/Resources/micrometer

Micro Finance Industry Network. (2026b). Micrometer Q1 FY 2026-27: Industry position as on June 30, 2026. https://mfinindia.org/NewsEvent/pressrelease

Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2022). Understanding the process of meanings, materials, and competencies in adoption of mobile banking. Electronic Markets, 32, 2445-2469. https://doi.org/10.1007/s12525-022-00610-7

Nandru, P., Madhavaiah, C., & Senthilkumar, S. A. (2023). Factors affecting the adoption of mobile payment services during the COVID-19 pandemic: An application of extended UTAUT2 model. Journal of Science and Technology Policy Management, 16(3), 405-431. https://doi.org/10.1108/JSTPM-03-2023-0044

National Payments Corporation of India. (2026). Unified Payments Interface (UPI) product statistics. https://www.npci.org.in/product/upi/product-statistics

Neves, C., Oliveira, T., Santini, F., & Gutman, L. (2023). Adoption and use of digital financial services: A meta-analysis of barriers and facilitators. International Journal of Information Management Data Insights, 3(2), 100201. https://doi.org/10.1016/j.jjimei.2023.100201

Patil, P., Tamilmani, K., Rana, N. P., & Raghavan, V. (2020). Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal. International Journal of Information Management, 54, 102144. https://doi.org/10.1016/j.ijinfomgt.2020.102144

Reserve Bank of India. (2025a). Annual report 2024-25. https://www.rbi.org.in/

Reserve Bank of India. (2025b). Reserve Bank of India (Digital Lending) Directions, 2025. https://www.rbi.org.in/

Reserve Bank of India. (2025c). Financial Inclusion Index for March 2025. https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=60875

Reserve Bank of India. (2026). RBI-Digital Payments Index for September 2025 (Press Release 2025-2026/2097). https://www.rbi.org.in/

Sharma, H., & Díaz Andrade, A. (2023). Digital financial services and human development: Current landscape and research prospects. Information Technology for Development, 29(4), 582-606. https://doi.org/10.1080/02681102.2023.2199189

Ullah, S., Kiani, U. S., Raza, B., & Mustafa, A. (2022). Consumers' intention to adopt m-payment/m-banking: The role of their financial skills and digital literacy. Frontiers in Psychology, 13, 873708. https://doi.org/10.3389/fpsyg.2022.873708

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425-478.

Yadav, R. S., & Kalluru, S. R. (2024). Principal-agent trust and adoption of digital financial services: Evidence from India. Economic Notes, 53(3), e12247. https://doi.org/10.1111/ecno.12247