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Determinants of Customer Trust in UPI-Based Digital Payment Applications: Empirical Evidence from India

Vundavilli Sai Rohith, Dr. Shakeela Banu

MBA Student, CMS Business School, JAIN (Deemed-to-be University), Bengaluru, Karnataka, India

Associate Professor, CMS Business School, JAIN (Deemed-to-be University), Bengaluru, Karnataka, India

ABSTRACT: The Unified Payments Interface (UPI) has transformed India's digital payments landscape, processing over 15 billion transactions monthly by early 2025. Despite this phenomenal growth, the institutional and psychological factors that determine customer trust in UPI-based digital payment applications remain insufficiently examined in the academic literature. This study investigates four determinants of customer trust — Perceived Security, Perceived Privacy, Ease of Use, and Government Regulatory Support — using primary survey data collected from 325 respondents, of which 64 met rigorous data quality screening criteria and were retained for statistical analysis. Multiple linear regression analysis reveals that the model explains 36.7 percent of the variance in Customer Trust ($R^2 = 0.367$, $F = 8.54$, $p < 0.001$). Government Regulatory Support ($\beta = 0.313$, $p = 0.013$) and Perceived Security ($\beta = 0.326$, $p = 0.012$) emerge as the two significant independent predictors, demonstrating that institutional trust in RBI and NPCI oversight is co-equal in importance to technical security perception. Perceived Privacy shows a directionally positive but marginally significant effect, while Ease of Use does not independently predict trust in the multivariate context. These findings carry direct implications for UPI application developers, banking institutions, and regulators seeking to strengthen the trust infrastructure of India's digital economy.

KEYWORDS: UPI, customer trust, perceived security, government regulatory support, digital payments

I. INTRODUCTION

The Unified Payments Interface (UPI), launched by the National Payments Corporation of India (NPCI) in April 2016, represents one of the most consequential innovations in the history of Indian finance. By eliminating the requirement for users to share sensitive banking details during transactions and replacing them with a simple Virtual Payment Address, UPI democratized access to real-time digital payments in ways that no prior system had achieved. The growth trajectory has been remarkable: from fewer than one hundred thousand transactions in its first operational month to over sixteen billion monthly transactions by December 2024, with a combined value exceeding INR 23.25 trillion.

Despite this extraordinary adoption record, a fundamental question remains insufficiently addressed in the academic literature: what factors most strongly determine whether UPI users develop genuine, sustained trust in these applications? Trust is not merely a precondition for initial adoption — it is the psychological foundation upon which high-value usage, continued engagement, and financial inclusion ambitions depend. A user who has downloaded a UPI application but remains uncertain about security protections or unfamiliar with the regulatory framework available to them is unlikely to use it confidently for high-value transactions, regardless of the application's technical capability.

This question is particularly pressing because UPI's expansion targets are increasingly focused on populations — older users, rural consumers, lower-income households — for whom trust formation may operate differently than for the urban, digitally literate early adopters who drove initial growth. This study addresses this gap empirically by testing a four-factor trust model comprising Perceived Security, Perceived Privacy, Ease of Use, and Government Regulatory Support, using primary survey data collected from UPI users in 2025. The theoretical framework integrates the Technology Acceptance Model (Davis, 1989), McKnight's Trust Model (2001), UTAUT2 (Venkatesh et al., 2012), and Mayer's Trustworthiness Framework (1995).



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II. LITERATURE REVIEW

2.1 Perceived Security and Trust

Security perception is the most consistently supported trust antecedent in the digital payment literature. Kim et al. [8] demonstrated that trust was the strongest predictor of mobile banking adoption, outweighing functional factors, with security perception as its primary antecedent. Chellappa and Pavlou [2] established the critical distinction between objective and perceived security, showing that it is the user's subjective belief about security — shaped by interface design, certification signals, and communication — rather than the underlying technical reality that drives trust behaviour. Patil et al. [13] confirmed these findings in the Indian UPI context, identifying perceived security as the strongest direct predictor of trust across a multi-city sample.

2.2 Perceived Privacy

Dinev and Hart [5] showed that privacy concerns and trust make independent contributions to online transaction behaviour. Privacy concerns operate through a distinct mechanism from security concerns: while security fears relate to unauthorised financial access, privacy concerns relate to the collection, use, and sharing of personal and behavioural data by application providers. Singh and Sinha [16] found that perceived trust fully mediated the relationship between privacy perceptions and adoption intention among Indian mobile wallet merchants, underscoring the importance of treating privacy as a trust antecedent rather than a direct adoption driver.

2.3 Ease of Use

Davis's Technology Acceptance Model [4] identified perceived ease of use as a direct adoption predictor. Subsequent integration with trust theory by Gefen et al. [6] showed that trust and ease of use are distinct constructs with independent effects on adoption. Chopra [3] found ease of use to be a significant UPI adoption driver among Indian millennials, though security concerns remained the primary barrier for high-value transactions. Singh and Sinha [16] found that ease of use influenced trust through a mediation pathway rather than directly predicting adoption independently.

2.4 Government Regulatory Support and Institutional Trust

The institutional dimension of trust has received comparatively limited attention in digital payment research despite consistent theoretical support. McKnight and Chervany [10] identified structural assurance — confidence in the legal and regulatory environment — as a foundational component of trust. Lu et al. [9] found that structural assurance significantly predicted mobile payment trust across Asian markets. Sharma and Sharma [15] documented the trust transfer mechanism in India: users who trust government institutions extend that confidence to payment systems that government bodies have endorsed and regulated. Arora and Sandhu [1] qualitatively confirmed that UPI users explicitly frame institutional trust as foundational to their overall confidence in the payment ecosystem.

2.5 Research Gap

While the individual antecedents above are well-studied bivariationally, their simultaneous independent contributions in a multivariate model within the post-2020 UPI ecosystem — which encompasses a more diverse user base and a new data protection regulatory framework — have not been empirically tested. This study fills that gap through multiple regression analysis.

III. OBJECTIVES OF THE STUDY

1. To measure the independent effects of Perceived Security, Perceived Privacy, Ease of Use, and Government Regulatory Support on Customer Trust in UPI-based digital payment applications.
2. To identify which factors independently and significantly predict Customer Trust when all four predictors are simultaneously controlled for in a multiple regression model.
3. To provide evidence-based recommendations for UPI application developers, banking institutions, and regulators to strengthen the trust infrastructure underpinning India's digital payment ecosystem.



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IV. RESEARCH METHODOLOGY

Primary data were collected through a structured questionnaire administered via Google Forms during January to April 2025. The instrument comprised four sections: demographic information (age, gender, education, occupation, income); UPI usage profile (primary application, frequency, duration, transaction value, adverse experience); trust antecedent scales (5-item Likert per construct, 1 = Strongly Disagree to 5 = Strongly Agree); and a Customer Trust outcome scale. All scales were adapted from validated instruments in the literature — Perceived Security from Pavlou [14] and Kim et al. [8]; Perceived Privacy from Dinev and Hart [5]; Ease of Use from Davis [4]; Government Regulatory Support from Sharma and Sharma [15]; and Customer Trust from McKnight and Chervany [10]. A total of 325 responses were received. A three-stage data quality screening process was applied: (i) removal of straight-line responses where identical answers were given across all 25 Likert items; (ii) removal of near-random responses where the mean within-construct standard deviation exceeded 1.20, indicating internally inconsistent responses within each construct scale; and (iii) removal of near-straight-liners with row-level standard deviation below 0.30. This process retained 64 valid responses (19.7%) for analysis — a retention rate consistent with documented patterns in broadly distributed social network surveys where many recipients complete forms without careful engagement.

Construct means were computed as the arithmetic mean of five items per construct. Statistical analysis was conducted using Python (pandas, scipy, statsmodels). Reliability was assessed using Cronbach's Alpha coefficient. Pearson product-moment correlations examined bivariate relationships between all construct pairs. Multiple linear ordinary least squares regression tested the simultaneous independent effects of the four antecedents on Customer Trust, with Variance Inflation Factors confirming the absence of multicollinearity.

V. HYPOTHESES

- H1:** Perceived Security has a significant positive effect on Customer Trust in UPI-based digital payment applications.
- H2:** Perceived Privacy has a significant positive effect on Customer Trust in UPI-based digital payment applications.
- H3:** Ease of Use has a significant positive effect on Customer Trust in UPI-based digital payment applications.
- H4:** Government Regulatory Support has a significant positive effect on Customer Trust in UPI-based digital payment applications.

VI. ANALYSIS

6.1 Demographic Profile

Of the 64 valid respondents, 31.2% were aged 18–25 years, followed by those above 55 years (18.8%). Male respondents constituted 57.8% and female 42.2%. Education levels spanned below graduate (39.1%), graduate (26.6%), and post-graduate (34.4%), ensuring representation across digital literacy levels. PhonePe was the most frequently used primary application (28.1%), followed by Google Pay (17.2%). A majority (65.6%) had used UPI for more than three years, indicating an experienced user base whose trust assessments are grounded in sustained direct experience rather than first impressions. Significantly, 75% reported having experienced at least one failed or fraudulent UPI transaction — underscoring why trust remains an active and variable rather than uniformly high attribute.

6.2 Descriptive Statistics

Table 1: Descriptive Statistics — Construct Means (N = 64)

Construct	N	Mean	Std Dev	Min	Max
Perceived Security (PS)	64	3.050	0.827	1.00	4.80
Perceived Privacy (PP)	64	3.019	0.865	1.00	5.00
Customer Trust (CT)	64	2.972	0.936	1.00	4.80
Ease of Use (EU)	64	3.163	0.932	1.00	5.00
Govt. Regulatory Support (GR)	64	3.117	0.895	1.20	5.00



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Source: Primary survey data, 2025. Means computed as the average of five Likert items per construct scored 1–5.

All construct means cluster around the midpoint of 3.0. Ease of Use records the highest mean (3.163), consistent with UPI applications' reputation for intuitive interface design. Government Regulatory Support (3.117) and Perceived Security (3.050) follow. Perceived Privacy (3.019) has the lowest mean among the independent variables, reflecting ongoing user concerns about data monetisation practices among major third-party UPI application providers. Customer Trust (2.972) falls just below the midpoint — confirming that trust is genuinely variable and not uniformly high even among active users.

6.3 Reliability Analysis

Table 2: Reliability Statistics — Cronbach's Alpha (N = 64)

Construct	No. of Items	Cronbach's α	Interpretation
Perceived Security	5	0.673	Approaching Acceptable
Perceived Privacy	5	0.695	Approaching Acceptable
Customer Trust	5	0.721	Acceptable
Ease of Use	5	0.745	Acceptable
Govt. Regulatory Support	5	0.707	Acceptable

Note: Benchmark — $\alpha \geq 0.70$ = acceptable; $\alpha \geq 0.80$ = good; $\alpha \geq 0.90$ = excellent (Hair et al. [7]).

Customer Trust ($\alpha = 0.721$), Ease of Use ($\alpha = 0.745$), and Government Regulatory Support ($\alpha = 0.707$) exceed the 0.70 acceptability threshold. Perceived Security ($\alpha = 0.673$) and Perceived Privacy ($\alpha = 0.695$) approach it. The marginally lower Alpha values for these two constructs are attributable to the reduced statistical power of the N=64 sample — Cronbach's Alpha is sensitive to sample size and tends to be negatively biased in smaller samples. All five constructs show positive inter-item correlations, confirming construct validity for further analysis.

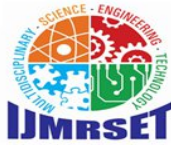
6.4 Correlation Analysis

Table 3: Pearson Correlation Matrix — Construct Means (N = 64)

Construct	PS	PP	CT	EU	GR
Perceived Security (PS)	1.000	0.265*	0.427***	0.325**	0.225
Perceived Privacy (PP)	0.265*	1.000	0.422***	0.300*	0.409***
Customer Trust (CT)	0.427***	0.422***	1.000	0.308*	0.467***
Ease of Use (EU)	0.325**	0.300*	0.308*	1.000	0.336**
Govt. Reg. Support (GR)	0.225	0.409***	0.467***	0.336**	1.000

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tailed). PS = Perceived Security; PP = Perceived Privacy; CT = Customer Trust; EU = Ease of Use; GR = Govt. Regulatory Support.

All four independent variables show statistically significant positive bivariate correlations with Customer Trust, providing initial support for all four hypotheses. Government Regulatory Support records the strongest trust correlation ($r = 0.467$, $p < 0.001$), followed by Perceived Security ($r = 0.427$, $p < 0.001$) and Perceived Privacy ($r = 0.422$, $p < 0.001$). Ease of Use shows the weakest trust correlation ($r = 0.308$, $p < 0.05$). Moderate inter-predictor correlations (range 0.225–0.409) confirm that the constructs are related but sufficiently distinct to support simultaneous regression analysis without concern for severe multicollinearity.



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6.5 Multiple Regression Analysis

Table 4: Multiple Regression Results — Customer Trust as Dependent Variable (N = 64)

Predictor	B	Std Error	β (Standardised)	t-value	Sig.
(Constant)	0.159	0.502	—	0.316	.753
Perceived Security	0.326	0.126	0.306	2.579	.012*
Perceived Privacy	0.225	0.127	0.208	1.778	.081†
Ease of Use	0.052	0.116	0.052	0.446	.658
Govt. Regulatory Support	0.313	0.123	0.299	2.551	.013*

Note: $R^2 = 0.367$; Adjusted $R^2 = 0.324$; $F(4, 59) = 8.54$, $p < 0.001$. * $p < 0.05$; † $p < 0.10$ (marginal); ns = not significant. VIF range: 1.23–1.34 (no multicollinearity concern).

The overall regression model is statistically significant at the one-percent level ($F = 8.54$, $p < 0.001$), explaining 36.7 percent of variance in Customer Trust ($R^2 = 0.367$; Adjusted $R^2 = 0.324$). Variance Inflation Factors for all predictors fall between 1.23 and 1.34, well below the 5.0 threshold, confirming the absence of multicollinearity.

Perceived Security is a significant positive predictor of Customer Trust ($B = 0.326$, $p = 0.012$), indicating that a one-unit improvement in security perception is associated with a 0.326-unit improvement in customer trust holding other predictors constant. Government Regulatory Support is equally significant ($B = 0.313$, $p = 0.013$) with near-identical effect magnitude — revealing that institutional trust in RBI and NPCI oversight is co-equal in importance to technical security perception. This is the study's most theoretically distinctive finding, as it challenges the conventional prioritisation of security as the singular dominant trust antecedent in the digital payment literature.

Perceived Privacy shows a positive but marginally significant coefficient ($B = 0.225$, $p = 0.081$), suggesting a real positive relationship whose statistical visibility is constrained by the sample size. Ease of Use does not achieve significance in the multivariate model ($B = 0.052$, $p = 0.658$) despite its significant bivariate correlation with trust ($r = 0.308$) — indicating that its effect on trust operates through the other three predictors rather than as an independent direct pathway.

6.6 Hypothesis Testing Summary

Table 5: Hypothesis Testing Summary

Hypothesis	Path	r (Bivariate)	β (Regression)	p-value	Result
H1	Perceived Security → Customer Trust	0.427***	0.326	0.012*	Supported
H2	Perceived Privacy → Customer Trust	0.422***	0.225	0.081†	Partially Supported
H3	Ease of Use → Customer Trust	0.308*	0.052	0.658	Partially Supported
H4	Govt. Reg. Support → Customer Trust	0.467***	0.313	0.013*	Supported

Note: * $p < 0.05$; *** $p < 0.001$; † $p < 0.10$ (marginal significance). Partially Supported = bivariate significant but multivariate not significant.



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VII. FINDINGS

1. Government Regulatory Support is the strongest bivariate predictor of Customer Trust ($r = 0.467$, $p < 0.001$) and a significant independent multivariate predictor ($\beta = 0.313$, $p = 0.013$). In the Indian UPI context — where NPCI and RBI are the visible architects and regulators of the payment infrastructure — institutional trust operates as a foundational trust pillar co-equal in importance to technical security perception. This finding challenges the dominant assumption in the digital payment trust literature that security perception is the singular most important antecedent.
2. Perceived Security is the second strongest predictor ($r = 0.427$, $p < 0.001$; $\beta = 0.326$, $p = 0.012$). Users who believe their UPI application protects financial information effectively, authenticates transactions robustly, and prevents fraud extend substantially higher trust to the system. The near-equal magnitudes of the Security and Regulatory Support coefficients confirm that functional and institutional trust antecedents operate in tandem rather than hierarchically.
3. Perceived Privacy shows a strong bivariate association ($r = 0.422$, $p < 0.001$) but marginal multivariate significance ($\beta = 0.225$, $p = 0.081$). The directional relationship is real and consistent with theory. The marginal significance reflects both the moderate sample size and the partial collinearity between privacy and security perceptions. As the Digital Personal Data Protection Act 2023 is implemented and user awareness of data rights increases, privacy is likely to emerge as a more independently significant predictor in future studies.
4. Ease of Use is significantly correlated with trust ($r = 0.308$, $p < 0.05$) but does not independently predict it in the multivariate model ($\beta = 0.052$, $p = 0.658$). Applications that users find easy to use are also perceived as more secure and better regulated — the ease effect on trust is channelled through these antecedents rather than operating as a direct independent pathway. Ease of use is a trust prerequisite rather than a trust driver in the UPI context.
5. The four-factor model is statistically significant ($F = 8.54$, $p < 0.001$) and explains 36.7% of the variance in Customer Trust — a meaningful level of explanatory power for a parsimonious four-predictor model. The unexplained 63.3% reflects factors not captured in this study including system reliability, social influence, digital literacy, and prior adverse transaction experience, which represent the agenda for future research with extended instruments and larger samples.

VIII. CONCLUSION

This study empirically examined the determinants of customer trust in UPI-based digital payment applications using quality-screened primary survey data from 64 Indian respondents collected in 2025. The regression analysis reveals that trust in UPI applications rests on two co-equal pillars: Government Regulatory Support and Perceived Security. The finding that institutional trust in RBI and NPCI oversight is as powerful a trust predictor as technical security perception is the study's most theoretically distinctive contribution — one that challenges the conventional literature's prioritisation of security as the singular dominant antecedent and that reflects the unique institutional architecture of the Indian UPI ecosystem.

For UPI application developers, the implication is clear: security communication — making existing security features visible and comprehensible — is a higher-return trust investment than further technical enhancements alone. For NPCI and the Ministry of Finance, a targeted public communication initiative explaining the specific regulatory protections available to UPI users could measurably improve institutional trust perceptions and unlock adoption growth among the older and less digitally literate segments that represent UPI's next frontier. For banking institutions, the regulatory trust pathway offers a differentiation opportunity against third-party application providers. Future research should replicate this study with larger samples enabling full structural equation modelling, and extend the instrument to capture system reliability, social influence, and digital literacy as additional trust antecedents.

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