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Unified Payments Interface and Payment Efficiency among Small and Medium Retailers: Evidence from an Indian Merchant Survey

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Abstract: India's Unified Payments Interface (UPI) has shifted everyday retail payments from cash handling toward interoperable, account-to-account transfers. Yet merchant-side evidence often emphasizes adoption rather than operational consequences. This study examines whether UPI improves payment efficiency among small and medium retailers and whether convenience, transaction intensity, and cost perceptions are associated with merchant satisfaction. A cross-sectional questionnaire produced 97 usable responses from grocery, food-service, apparel, electronics, pharmacy, and other retail businesses operating in urban and semi-urban settings. Descriptive statistics, chi-square tests, Pearson correlation, and an exploratory linear model were used. UPI was deeply embedded in the sampled firms: 81.44% reported that customers used it very frequently or almost always, 85.57% stated that it reduced physical-cash handling, 80.41% considered it more cost-effective than cards, and 79.39% agreed that it reduced payment disputes. Satisfaction was high, with 93.81% assigning a rating of 4 or 5. Perceived convenience was associated with satisfaction ($p = .0036$), whereas perceived cost-effectiveness was not ($p = .243$). The share of daily transactions conducted through UPI correlated positively with satisfaction ($r = .437$, 95% CI [.26, .59], $p < .001$). However, a categorical multivariable specification combining transaction-share bands and convenience was not significant overall ($p = .588$), indicating that bivariate associations should not be interpreted as causal effects. Delayed receipts, failed transactions, connectivity limitations, and fraud concerns remain material frictions. The findings position UPI as operational infrastructure for small-retailer efficiency while identifying reliability and merchant-support priorities necessary for sustained value creation.

Keywords: Unified Payments Interface, digital payment, payment efficiency, small retailers, merchant satisfaction, India.

1. Introduction

Fast-payment systems have become a core layer of contemporary retail infrastructure. In India, UPI enables real-time, interoperable bank-account transfers through mobile applications and standardized interfaces. Its open architecture allows customers and merchants to transact across participating banks and third-party applications, reducing the need for bilateral acceptance arrangements. The platform's scale is no longer marginal: NPCI recorded 22.72 billion transactions valued at approximately 28.92 trillion in June 2026 (National Payments Corporation of India [NPCI], 2026). This expansion makes merchant-side performance an important research question rather than a simple measure of technology adoption.

Small and medium retailers are a revealing context because

payment frictions immediately affect checkout time, cash reconciliation, transaction records, working-capital visibility, and customer experience. QR-based acceptance has a low physical setup burden, but operational benefits are not automatic. Failed transactions, uncertain confirmation, delayed receipt, weak connectivity, social-engineering fraud, and limited grievance support may transfer new risks to merchants. Consequently, high adoption can coexist with uneven payment efficiency.

Prior research has largely examined consumers' behavioral intention through the Unified Theory of Acceptance and Use of Technology (UTAUT), diffusion-of-innovation constructs, perceived usefulness, trust, or risk. Recent evidence suggests that performance expectancy, attitude, trust, and facilitating conditions influence UPI use (Fahad & Shahid, 2022; Razi-ur-Rahim et al., 2024). Research on Indian mobile wallets further indicates

that service quality generates loyalty partly through perceived value and user satisfaction (Ellaturu et al., 2024), while earlier electronic-banking evidence emphasizes the importance of a consistent and effortless customer experience across digital channels (Nagaraju & Subbarayudu, 2017). Institutional research likewise attributes UPI's diffusion to interoperability, open technical architecture, private-sector participation, and an enabling regulatory environment (Cornelli et al., 2024). Less attention has been paid to post-adoption outcomes at the merchant interface, particularly the relationship between transaction intensity, operational efficiency, and satisfaction.

This study addresses that gap with a retailer-level survey. It asks three connected questions: (1) how extensively is UPI used within sampled retail operations; (2) what benefits and frictions do merchants report; and (3) are convenience, cost perceptions, and UPI transaction intensity associated with satisfaction? The paper contributes by separating adoption from realized operational value, integrating descriptive and inferential evidence, and interpreting the results within a merchant-efficiency framework.

2. Theoretical Background and Hypotheses

2.1. UPI as a retail payment infrastructure

UPI combines instant settlement instructions, interoperable identifiers, mobile interfaces, and standardized application programming interfaces. Unlike closed-loop wallets, the system allows a user of one application to transact with a merchant served through another provider. Cornelli et al. (2024) argue that this technology-agnostic arrangement, coupled with regulatory support and public-private coordination, helped UPI scale rapidly. For merchants, interoperability can reduce acceptance complexity and make digital payments accessible without conventional point-of-sale hardware.

2.2. Convenience, efficiency, and satisfaction

Technology-acceptance theory proposes that perceived usefulness or performance expectancy and perceived ease of use shape adoption and continued use (Davis, 1989; Venkatesh et al., 2003). The information-systems success perspective similarly treats satisfaction as an evaluative mechanism through which system quality and use translate into organizational benefits. Evidence from Indian manufacturing firms shows that user satisfaction plays an important role in converting enterprise-system implementation into organizational performance (Kishore et al., 2025). In a merchant-payment setting, convenience is therefore not merely interface simplicity. It includes transaction speed, ease of confirmation, reduced cash counting, lower reconciliation effort, and the ability to meet customer payment preferences. These operational advantages should improve the merchant's overall evaluation of the payment method.

H1: Perceived convenience of UPI relative to cash is associated with merchant satisfaction.

2.3. Cost-effectiveness and satisfaction

Merchants may perceive QR-based UPI acceptance as less costly than card acceptance because it requires limited hardware and can reduce cash-management effort. Nevertheless, satisfaction may be driven more strongly by reliability, customer demand, and ease of operation than by perceived cost alone. Mobile-wallet research in Bengaluru demonstrates that technical and service-quality perceptions create value only when they are translated into satisfactory user experiences (Ellaturu et al., 2024). Likewise, electronic-banking research suggests that customer experience depends on the consistency and effortlessness of the entire service encounter rather than on a single economic attribute (Nagaraju & Subbarayudu, 2017). The cost-satisfaction relationship therefore warrants empirical testing rather than assumption.

H2: Perceived cost-effectiveness of UPI relative to cards is associated with merchant satisfaction.

2.4. Transaction intensity and satisfaction

Diffusion-of-innovation theory distinguishes initial adoption from routinization: an innovation creates value when it becomes embedded in recurring practice (Rogers, 2003). A greater UPI share may give merchants more opportunities to realize record-keeping, cash-handling, and customer-service benefits. This reasoning is compatible with research showing that the performance contribution of enterprise technologies depends on experienced user satisfaction (Kishore et al., 2025). At the level of small enterprises, managerial efficiency also depends on knowledge, economic motivation, confidence, and the capacity to use available systems productively (Raghunatha & Nagaraju, 2022). Thus, payment adoption alone may be insufficient unless the technology becomes reliably integrated into daily routines. Conversely, satisfied merchants may encourage more UPI use. Because the design is cross-sectional, the expected relationship is associative rather than causal.

H3: The share of daily transactions conducted through UPI is positively correlated with merchant satisfaction.

H4: UPI transaction-share categories and perceived convenience jointly explain variation in merchant satisfaction.

3. Materials and Methods

3.1. Design and sample

The study used a cross-sectional, retailer-level survey with quantitative analysis and open descriptive input. The source dataset contained 97 usable responses from small and medium retail businesses in urban and semi-urban settings. Respondents represented food and beverage outlets, apparel and fashion stores, grocery and kirana stores, electronics and mobile stores, pharmacies, and other retail formats. All participating businesses accepted UPI. The original project describes retailer

selection as random; however, no complete sampling frame or selection probabilities were documented. The present paper therefore treats the sample as an exploratory field sample and avoids population-level prevalence claims.

3.2. Instrument and measures

A structured questionnaire captured business category, duration of digital-payment acceptance, commonly used UPI application, customer-use frequency, share of daily UPI transactions, perceived convenience relative to cash, reduction in cash handling, dispute reduction, impact on sales records, cost-effectiveness relative to cards, operational challenges, receipt delays, and overall satisfaction. Satisfaction was measured on a five-point scale. Convenience and transaction share were recorded as ordered categories; several operational outcomes used yes/no/maybe or agreement-type responses.

3.3. Analytical strategy

Frequencies and percentages were used to profile adoption and outcomes. Pearson's chi-square test assessed the association of satisfaction with convenience (H1) and cost-effectiveness (H2). Pearson correlation evaluated the relationship between the reported share of UPI transactions and satisfaction (H3). An exploratory linear model regressed satisfaction on categorical transaction-share and convenience indicators (H4). Two-sided *p* values below .05 were treated as statistically significant. The analyses were originally executed in R. Because the sample is modest and several predictors are categorical, results are interpreted as exploratory associations; no causal claims are made.

Table 1: Sample profile and digital-payment maturity

Characteristic	Category	n	%
Retail format	Food and beverages	25	25.77
	Apparel/fashion	24	24.74
	Grocery/kirana	16	16.49
	Electronics/mobile	12	12.37
	Pharmacy/medical	12	12.37
	Other	8	8.25
Digital-payment tenure	> 3 years	57	58.76
	1-3 years	31	31.96
	6-12 months	6	6.19
	< 6 months	3	3.09

Note. *N* = 97. Percentages are calculated from the source survey.

4. Results

4.1. Adoption intensity and application use

UPI use was highly routinized in the sample. PhonePe was the most commonly used application among customers (59.79%), followed by Google Pay (23.71%); BHIM and Paytm each accounted for 8.25%. Customer-use frequency was also high: 44.33% of merchants selected 'very frequently' (60-90% of transactions) and 15.46% selected 'almost always' (more than 90%). Only three respondents reported occasional or rare use.

Table 2: Customer UPI-use frequency reported by merchants

Frequency category	n	%
Almost always (> 90%)	15	15.46
Very frequently (60-90%)	43	44.33
Often (30-60%)	36	37.11
Occasionally (10-30%)	2	2.06
Rarely (< 10%)	1	1.03

Note. *N* = 97

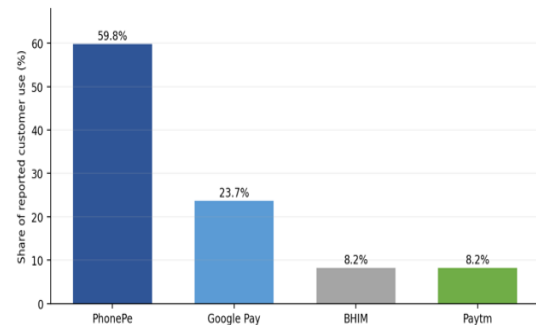


Figure 1: Commonly used UPI applications among customers

4.2. Operational efficiency and remaining frictions

Reported operational effects were predominantly favorable. Eighty-three retailers (85.57%) stated that UPI reduced physical-cash handling. Seventy-seven (79.39%) agreed or strongly agreed that it reduced disputes relative to cash or cards. Fifty-nine (60.82%) reported that sales-record accuracy or ease improved, while 32.99% observed no major change and 6.19% found tracking more difficult. Seventy-eight retailers (80.41%) regarded UPI as more cost-effective than cards.

The benefits coexisted with service frictions. Sixty-one respondents (62.89%) reported having experienced delays in receiving UPI payments, and another 17.53% selected 'maybe.' The most frequently selected challenge was slow or failed transactions (24.74%), followed by poor connectivity (23.71%) and fraud or security concerns (21.65%). More than one-quarter reported no major challenge.

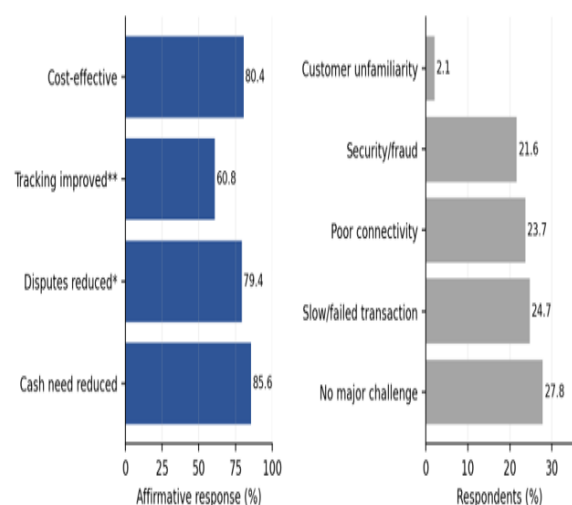


Figure 2: Operational benefits and implementation challenges

Table 3: Merchant-reported operational outcomes

Outcome	Affirmative definition	n	%
Reduced physical-cash handling	Yes	83	85.57
Reduced payment disputes	Agree + strongly agree	77	79.39
Improved sales tracking	Somewhat + greatly improved	59	60.82
More cost-effective than cards	Yes	78	80.41
Experienced receipt delays	Yes	61	62.89

Note. $N = 97$. Outcomes were measured with different response formats; affirmative definitions are shown explicitly.

4.3. Satisfaction and hypothesis tests

Satisfaction was high: 44 respondents (45.36%) rated UPI 5, 47 (48.45%) rated it 4, five (5.15%) rated it 3, and one (1.03%) rated it 2. The mean score calculated from this distribution was 4.38 ($SD = 0.63$).

Table 4: Distribution of merchant satisfaction

Satisfaction rating	n	%
2	1	1.03
3	5	5.15
4	47	48.45
5	44	45.36
Total	97	100.00

The chi-square test supported H_1 : convenience relative to cash was associated with satisfaction ($p = .0036$). H_2 was not supported because cost-effectiveness relative to cards was not associated with satisfaction ($p = .243$). H_3 was supported: UPI transaction share had a moderate positive correlation with satisfaction, $r = .437$, 95% CI [.26, .59], $t(95) = 4.74$, $p < .001$. The reported multivariable categorical model was not significant overall ($p = .588$), so H_4 was not supported. The source output suggested a positive coefficient for the $> 80\%$ transaction-share category, but the model-level test did not establish joint explanatory power.

Table 5: Inferential results

Hypothesis	Relationship/test	Statistic reported	p	Decision
H1	Convenience $\times$ satisfaction	Chi-square association	0.0036	Supported
H2	Cost-effectiveness $\times$ satisfaction	Chi-square association	0.243	Not supported
H3	UPI transaction share $\times$ satisfaction	$r = .437$; 95% CI [.26, .59]	$< .001$	Supported
H4	Transaction-share categories + convenience $\rightarrow$ satisfaction	Overall model test	0.588	Not supported

Note. Exact chi-square statistics and degrees of freedom were not available in the retained source output; p values are reproduced as reported. H3: $t(95) = 4.74$.

Cost-effectiveness, however, was not independently associated with satisfaction. This result is theoretically useful. Once a low-cost payment method becomes normalized, reliability and usability may become hygiene factors that matter more to the merchant's overall evaluation. The result echoes the broader customer-experience argument that digital-channel evaluations arise from the coherence of the full service journey, not only its monetary cost (Nagaraju & Subbarayudu, 2017). Satisfaction therefore appears to reflect experienced perfor-

5. Discussion

5.1. Interpretation of the findings

The evidence indicates that UPI has moved beyond initial adoption and become a routine payment channel in the sampled retailers. High customer-use frequency, long digital-payment tenure, and a large reported transaction share suggest institutionalization at the point of sale. This pattern is consistent with the wider UPI ecosystem, where interoperable architecture and broad application choice reduce merchant acceptance barriers (Cornelli et al., 2024).

Operational benefits were not limited to speed. Merchants associated UPI with lower cash-handling requirements, fewer disputes, improved sales tracking, and favorable cost perceptions. These mechanisms explain why UPI can enhance payment efficiency even without directly increasing sales: it reduces reconciliation work, produces searchable records, and accommodates customer preferences. The significant convenience-satisfaction association aligns with technology-acceptance research, which treats performance expectancy and ease of use as central to continued technology use (Davis, 1989; Razi-ur-Rahim et al., 2024; Venkatesh et al., 2003). It also extends Ellaturu et al.'s (2024) consumer-side finding that mobile-wallet quality is converted into loyalty through perceived value and satisfaction. In the present merchant context, convenience appears to be an operational expression of service quality and satisfaction is the merchant's summary assessment of realized value.

mance, confirmation clarity, and ease of problem resolution rather than cost perception alone.

The positive correlation between transaction share and satisfaction supports a routinization argument: merchants who process more payments through UPI tend to evaluate it more favorably. Yet the nonsignificant categorical regression cautions against a simple dose-response claim. The difference may reflect information loss from categorizing transaction share, sparse cells, nonlinear relationships, or overlap between conve-

nience and use intensity. It may also reflect reverse directionality, with satisfied merchants encouraging more customers to use UPI.

5.2. Reliability as the next stage of value creation

The challenge profile reveals the next policy and managerial frontier. Nearly two-thirds reported having experienced receipt delays, and failed transactions, weak connectivity, and security concerns were common. These frictions create hidden costs: checkout queues, duplicate-payment uncertainty, manual verification, customer conflict, and working-capital ambiguity. Growth in transaction volume must therefore be matched by service availability, rapid status reconciliation, fraud controls, and accessible dispute resolution.

5.3. Theoretical contribution

The study extends adoption-focused reasoning in three ways. First, it treats payment efficiency as a post-adoption outcome rather than equating use with success. Second, it positions transaction intensity as a marker of routinization and links it to merchant satisfaction. Third, it shows that positive efficiency perceptions can coexist with substantial reliability frictions. This duality suggests that merchant continuance is shaped by both realized operational value and the cost of payment exceptions. Conceptually, the finding connects digital-wallet service quality and satisfaction (Ellaturu et al., 2024), electronic-banking customer experience (Nagaraju & Subbarayudu, 2017), and information-system satisfaction and performance (Kishore et al., 2025) within a single merchant-payment setting.

6. Implications

6.1. Implications for retailers

Retailers should maintain more than one UPI acceptance route, train staff to verify transaction status within approved applications rather than relying on customer screenshots, reconcile UPI receipts daily, and establish a clear protocol for pending or reversed payments. Integrating transaction exports with bookkeeping can convert payment records into cash-flow and sales insights. Because small-enterprise efficiency is partly capability-dependent, retailer education should address not only fraud awareness but also record use, exception management, and routine financial reconciliation (Raghunatha & Nagaraju, 2022).

6.2. Implications for banks, payment providers, and NPCI

Providers should prioritize transaction-status clarity, rapid exception resolution, multilingual merchant support, and low-bandwidth functionality. Merchant dashboards should distinguish pending, successful, failed, and reversed transactions in plain language. Fraud prevention should combine real-time warnings with practical education on QR-code substitution,

collect requests, screen-sharing scams, and false confirmation messages.

6.3. Policy implications

Public policy should evaluate digital-payment progress through reliability, grievance resolution, and small-merchant capability—not transaction volume alone. Connectivity investment and targeted digital-financial literacy remain important for semi-urban and low-resource settings. The regulatory emphasis on consumer protection and payment-system oversight should be complemented by merchant-specific service standards and transparent reporting of failed and reversed transactions.

7. Limitations and Future Research

The study has several limitations. The sample is small ($N = 97$), geographically bounded, and not supported by a documented probability sampling frame. All measures are self-reported and collected at one point in time, creating risks of common-method bias and recall error. The questionnaire uses several categorical single-item measures, which constrain reliability assessment and multivariable modeling. Merchant size, turnover, location, and transaction value were not fully controlled. The reported regression output is based on categorized predictors and provides limited coefficient detail.

Future research should employ stratified multi-city samples, validated multi-item constructs, and objective transaction records. Longitudinal designs could test whether improved reliability causes higher transaction share and satisfaction. Multi-group analysis could compare kirana stores, pharmacies, restaurants, and apparel outlets; urban and semi-urban merchants; and micro versus medium firms. Structural-equation or ordinal-regression models could examine whether reliability, trust, and record-keeping mediate the relationship between UPI use intensity and business outcomes.

8. Conclusion

UPI functions as more than a payment option for the sampled retailers: it is an operational infrastructure that reduces cash handling, supports transaction records, limits disputes, and aligns with customer preferences. Merchant satisfaction is strongly favorable and is associated with perceived convenience and UPI transaction intensity, but not with cost-effectiveness alone. The coexistence of high satisfaction with frequent delays and technical concerns shows that scale does not eliminate service-quality risk. The next phase of UPI-led retail transformation should therefore emphasize reliable confirmation, exception handling, fraud resilience, connectivity, and merchant capability. With these supports, UPI can deliver more consistent efficiency gains to small and medium retailers while strengthening the inclusiveness and formalization of India's retail economy.

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