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Retailers and UPI in India: A Systematic Review of Adoption, Barriers and Opportunities

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Abstract
India's Unified Payments Interface (UPI) has rapidly become a staple in everyday retail transactions. However, research on how merchants adopt and continue to use it is dispersed across small-scale studies, industry analyses, and policy reports. This systematic review consolidates peer-reviewed studies and credible grey literature from 2016 onwards to shed light on retailer adoption, challenges, and opportunities in person-to-merchant (P2M) payments. By employing established frameworks such as the Technology Acceptance Model, UTAUT, Technology-Organization-Environment, and Diffusion of Innovations, we categorize findings into seven factor clusters and interpret descriptive ecosystem series as contextual rather than causal evidence. Three key findings emerge. Firstly, infrastructure and reliability are fundamental prerequisites: consistent confirmations and robust transaction flows at smaller amounts enable all other advantages. Secondly, trust and conflict resolution, clear mechanisms for addressing issues, transparent guidelines for unsuccessful payments, and reliable confirmation signals affect the willingness to use UPI for everyday transactions. Thirdly, human processes are crucial: on-boarding that aligns with store operations, straightforward reconciliation, and basic job aids encourage ongoing use. Additional factors include cost considerations (certainty of fees, visibility of settlements), process integration (connections between POS and accounting, dashboards), customer attraction (widespread QR codes, prompts, loyalty programs), and the policy/institutional framework (standards for interoperability, incentives, and evolving credit-on-UPI features). Variability exists between kirana and organized retail, urban and rural locations, different sectors, and company sizes. Some limitations include reliance on secondary sources, diverse measurement methods, and limited causal identification for recent characteristics. We propose a future plan that encompasses longitudinal and causal research designs, measurement of dispute occurrences, randomized evaluations of reconciliation tools, studies targeting rural or specific sectors, assessments of fee structures, the impact of credit on UPI, and perceptions of privacy and data sharing. Overall, India has the infrastructure for widespread merchant acceptance; however, turning this infrastructure into habitual use requires coordinated reliability, clear consumer protection, and integration at the process level.

Keywords: UPI (Unified Payments Interface), Merchant Adoption, Digital Payments, Technology Acceptance Frameworks, P2M (Person-to-Merchant) Transactions

I. INTRODUCTION

India's Unified Payments Interface (UPI) is a real-time, account-to-account system that operates on banking infrastructure and is managed by the National Payments Corporation of India (NPCI). It supports both person-to-person and person-to-merchant transactions (Cornelli et al., 2024). For retailers, especially small merchants and kirana stores, UPI's interoperable QR code acceptance and immediate settlement have alleviated acquisition and operational challenges compared to card-based systems (World Bank, 2021; NPCI, 2022). The value proposition for merchants has expanded with features like UPI AutoPay for recurring payments, the integration of RuPay credit cards with UPI, pre-approved credit lines, and user-friendly or conversational interfaces (UPI Lite, Tap & Pay, Hello! UPI) designed to enhance reliability and usability for small transactions at the point of sale (NPCI, 2020, 2023, 2024a, 2025; RBI, 2022). Policy vision statements increasingly emphasize P2M as a crucial component of digital public infrastructure, focusing on interoperability, security, and inclusivity (RBI, 2022). In

this context, it is both analytically significant and operationally critical to understand the factors influencing retailer adoption and continued use, the ongoing barriers, and the new opportunities that have emerged (Cornelli et al., 2024; Worldline India, 2024).
While the overall growth of UPI is well-documented, evidence from the merchant perspective is scattered across small-scale field studies, working papers, industry analyses, and policy documents, rather than being consolidated into a comprehensive narrative. Initial research on micro-merchants in Jaipur indicated that even when payment acceptance is feasible, usage may be limited due to perceived risks, narrow profit margins, and workflow challenges (Ligon et al., 2019; IFMR LEAD & Catalyst, 2018). A related IVRS study suggested that simple prompts can encourage initial trials but may not overcome fundamental operational limitations without improved tools and support (IFMR LEAD, 2017). Ecosystem and policy briefings discuss India's rapid adoption and institutional framework, yet they rarely delve into retailer-specific factors beyond general trends (Cornelli et al., 2024; Routh, 2024). Industry reports track the growth of P2M transactions and acceptance trends, but they also highlight variations in reliability, dispute resolution, and reconciliation experiences across different regions and retail formats (Worldline India, 2024). Meanwhile, consumer-oriented narratives and international comparisons (e.g., Findex) capture the broader shift to digital payments without directly addressing what aids or hinders merchants in adopting and sustaining UPI usage (World Bank, 2022). This results in a fragmented understanding that complicates decision-making for retailers, PSPs/TPAPs, and policymakers who need a unified overview of obstacles, facilitators, and impactful interventions.

This systematic review synthesizes empirical studies and credible grey literature to clarify why retailers in India adopt and continue using UPI. It has three primary objectives. First, it offers an unbiased overview of P2M by leveraging reliable ecosystem series and industry analyses to comprehend retailer behavior without overemphasizing headline growth (NPCI, n.d.; Worldline India, 2024). Second, it organizes diverse findings on factors and obstacles using established adoption frameworks, Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Technology-Organization-Environment (TOE), and Diffusion of Innovations (Davis, 1989; Venkatesh et al., 2003; Tornatzky & Fleischer, 1990; Rogers, 2003), while considering India's unique policy and product landscape (Cornelli et al., 2024; RBI, 2022; NPCI, 2020, 2022, 2023, 2024a, 2025). Third, it identifies potential opportunities arising from recent changes in rules and features such as credit on UPI, recurring payments, and lightweight methods clarifying the conditions under which they could be most beneficial to retailers (NPCI, 2020, 2023, 2024a, 2025; RBI, 2022). By integrating micro-level studies with a broader ecosystem context, the review aims to guide managerial decisions (onboarding, process integration, risk communication) and policy development (interoperability hygiene, dispute processes, incentives). Section II gathers existing research and practitioner resources on retailers' acceptance and utilization, highlighting both agreements and discrepancies. Section III outlines the review methodology, detailing information sources, inclusion criteria, and data extraction. Section IV provides a concise overview of P2M, drawing from reputable ecosystem series. Section V explores how various factor clusters,such as infrastructure and reliability; security, trust, and disputes; knowledge and onboarding; cost economics; process integration; customer demand and promotions; and policy and institutional environment,impact adoption and ongoing use, noting differences based on retailer type and location. Section VI discusses the study's limitations; Section VII suggests a future research agenda; and Section VIII concludes with practical implications for retailers, PSPs/TPAPs, and policymakers.

II. LITERATURE REVIEW

Davis (1989) proposed that technology acceptance is shaped by its perceived usefulness and ease of use, a concept often employed to understand how small businesses adopt payment systems. Building on this idea, Venkatesh, Morris, Davis, and Davis (2003) underscored the significance of social influence and facilitating conditions, which are vital in kirana environments where peer signals and on-site assistance are pivotal. Tornatzky and Fleischer (1990) introduced an organizational and environmental perspective, arguing that capabilities, compatibility, and institutional pressures collectively affect adoption. Rogers (2003) highlighted observability, trialability, and communication channels, which elucidate the spread of QR codes among local merchant networks. In the Indian context, Cornelli, Frost, Gambacorta, Sinha, and Townsend (2024) demonstrated how UPI's interoperable, account-to-account framework can shape merchants' evaluation of benefits versus risks. Practitioner guides mirror these factors: CGAP (2019) concentrated on acceptance devices and onboarding, while the International Finance Corporation (2020) pinpointed everyday process frictions that influence merchant usage.

Ligon, Malick, Sheth, and Trachtman (2019) investigated small retailers in Jaipur and discovered that, despite the availability of digital payment options, their actual use is often hindered by concerns about fraud and potential workflow disruptions. According to IFMR LEAD and Catalyst (2018), familiarity with QR codes grows with exposure but is influenced by the necessity for daily reconciliation and staff routines. In a related study, IFMR LEAD (2017) experimented with IVRS nudges, finding that simple prompts can encourage initial trials, but sustained use depends on tools that fit the shop's operational rhythm. Worldline India (2024) noted a steady increase in P2M acceptance among both organized retail chains and local kirana stores, with variations based on location and time of day. The RBI

(2022) highlighted the importance of P2M for financial inclusion, while NPCI (2020, 2022, 2023, 2024a) introduced features like AutoPay, card linkage, and credit lines to expand merchant use-cases beyond just debit transactions. NPCI (n.d.-a; n.d.-b) also documented lightweight or conversational modalities aimed at enhancing usability for small-value and offline transactions. Cornelli et al. (2024) viewed these advancements as part of a strategic framework designed to lower acquisition barriers. From a comparative perspective, the IMF (2025) underscored the significance of interoperability in retail payments, and Routh (2024) explained how nonbanks leverage UPI to offer bundled services to merchants. Overall, the literature indicates a growing acceptance with significant variation by retailer type (organized vs. kirana) and geographic location (urban vs. rural), aligning with Worldline India's (2024) observations of the ecosystem.

Worldline India (2024) consistently emphasized infrastructure and reliability as practical limitations, with network and device issues causing queues and lost sales. To tackle these challenges in small transactions, NPCI (n.d.-b) introduced lightweight modes designed for constrained environments. In terms of security, trust, and disputes, CERT-In (2024) warned about common fraud patterns that could erode confidence, while RBI (2019) set turnaround time standards for failed transactions to ensure consistent redress. Research on micro-merchants revealed gaps in knowledge and onboarding: IFMR LEAD (2017) found that prompts are helpful, but training and routine integration are more crucial; IFMR LEAD and Catalyst (2018) noted that staff turnover and documentation requirements can impede adoption. Regarding cost economics, CGAP (2020) analyzed pricing strategies for instant payments, and IFC (2020) discussed the reconciliation and bookkeeping burdens faced by small retailers. On the policy and institutional front, NPCI (2023, 2024a, 2024b) issued operating circulars on pre-approved credit lines, credit accounts, and inward credit limits that affect onboarding processes and transaction sizes. The Department of Financial Services (2024) and the Press Information Bureau (2025) outlined incentive programs for low-value P2M transactions aimed at alleviating cost concerns for small merchants. Cornelli et al. (2024) and Venkatesh et al. (2003) suggested that improvements in reliability and dispute resolution processes enhance perceived usefulness, which can encourage continued use.

According to IFC (2020), integrating processes by linking QR with billing, inventory, and accounts can reduce reconciliation costs and make digital acceptance the standard. Worldline India (2024) further observed that employing analytics and visibility tools, such as dashboards and settlement reports, can transform payment data into operational insights and promote repeated use. NPCI (2022, 2023, 2024a) and RBI (2022) discussed credit pathways on UPI, including card linkage and pre-approved lines, which provide flexibility in transaction sizes and working-capital applications for retailers, provided that terms and dispute resolution are clearly defined. NPCI (n.d.-a) emphasized conversational experiences that could enhance customer engagement at checkout and aid merchant onboarding. Cornelli et al. (2024) and the World Bank (2021) highlighted that the widespread use and interoperability of QR codes help keep acquisition costs low and facilitate expansion into semi-urban and rural areas. Collectively, these strategies suggest practical ways to enhance ongoing usage, beyond just initial adoption.

Indian literature, while offering valuable insights, often lacks cohesion. Detailed studies from Jaipur illuminate practical challenges (Ligon et al., 2019; IFMR LEAD & Catalyst, 2018), whereas policy and product documents outline evolving regulations and features (RBI, 2022; NPCI, 2020, 2022, 2023, 2024a), and ecosystem reports track the extent of acceptance (Worldline India, 2024). However, there is a notable scarcity of theory-driven analyses that compare factors across various retail formats and regions, and evaluate the outcomes post-merchant integration. This review addresses this gap by organizing the evidence using established adoption frameworks and directly linking the findings to the Indian policy and product landscape.

RESEARCH METHODOLOGY

This study adopts a Systematic Literature Review (SLR) design that integrates peer-reviewed academic research with credible grey literature to synthesize evidence on *retailer adoption, barriers, and opportunities of UPI in India*. The methodological framework follows the PRISMA 2020 standards for transparency, reproducibility, and rigor (Page et al., 2021). Given the multidisciplinary nature of digital payments, this approach was chosen to capture both the behavioral realities of merchants at the shop floor level and the institutional evolution of policy and product design by organizations such as the Reserve Bank of India (RBI) and the National Payments Corporation of India (NPCI). The review combines evidence from quantitative, qualitative, and mixed-methods studies, as well as official reports, policy papers, and industry syntheses that directly influence merchant decision-making.

The literature search was conducted between March and September 2025, covering a comprehensive range of databases including Scopus, Web of Science Core Collection, EconLit, Business Source Premier, and SSRN, along with Google Scholar for expanded discovery. Boolean search strings were carefully designed to capture studies related to payment schemes, merchant adoption, and behavioral determinants. The general search syntax used was: ("Unified Payments Interface" OR UPI OR "real-time payments" OR "instant payments") AND (merchant OR retailer OR kirana OR MSME OR "micro-merchant") AND (adoption OR acceptance OR continuance OR usage OR barriers OR "person-to-merchant" OR P2M). To ensure India-specific representation, additional searches were

conducted through the official repositories of the RBI and NPCI, including circulars, press releases, and feature brochures. Complementary insights were drawn from international institutional repositories such as the Bank for International Settlements (BIS), International Monetary Fund (IMF), World Bank, CGAP, International Finance Corporation (IFC), and Worldline India. A snowballing approach was used to identify further relevant works through reference lists and author profiles, ensuring that the corpus was as exhaustive as possible for the Indian UPI–retailer context.

The inclusion and exclusion criteria were designed to ensure relevance and methodological soundness. Studies were included if they focused on India, examined retailers or merchants (including kirana stores, MSMEs, and organized chains), and analyzed the adoption or usage of UPI or other person-to-merchant (P2M) payment systems. Both empirical studies quantitative, qualitative, or mixed-method and credible grey sources such as RBI/NPCI circulars, BIS/IMF/World Bank/IFC/CGAP publications, and industry reports were included. The timeframe was limited to 2016 onward, corresponding to the launch and diffusion of UPI. English-language studies were prioritized, although methodologically clear Hindi-language materials were also reviewed. Studies focusing exclusively on consumers, purely theoretical papers lacking merchant implications, duplicate reports based on identical datasets, non-Indian contexts, or commentaries without clear sources were excluded. This ensured that the review retained methodological rigor and contextual accuracy.

The search and screening process followed the PRISMA three-stage protocol. In the identification stage, a total of 324 records were retrieved across all databases and institutional sources. During the screening stage, 96 studies were retained after title and abstract review. In the eligibility and inclusion stage, after full-text assessment and the removal of duplicates and non-relevant items, a total of 32 studies were selected for the final synthesis. A PRISMA flow diagram was prepared to depict the identification, screening, and inclusion process.

For each included study, a structured data extraction template was used to document bibliographic details, study design, merchant type (organized/kirana), location (urban/rural), UPI feature context (e.g., QR, AutoPay, Credit on UPI, Pre-approved credit lines), determinants (usefulness, trust, skills, cost, policy, and process factors), and outcome variables (adoption, continuance, reconciliation experience). The extracted data were organized using the factor-listing and tally method commonly used in narrative SLRs. Each determinant or barrier empirically supported by research or reported by credible institutional sources was recorded under one of seven thematic clusters: (1) Infrastructure & Reliability, (2) Security/Trust & Disputes, (3) Knowledge & Onboarding, (4) Cost Economics, (5) Process Integration, (6) Customer Demand & Promotions, and (7) Policy & Institutional Support. Frequency counts across these clusters provided an indication of their relative significance, while qualitative excerpts preserved interpretive nuances from each source.

Instead of using a numerical risk-of-bias scoring system, this review adopted a qualitative credibility assessment framework that focused on transparency and source accountability. Peer-reviewed articles were evaluated for methodological clarity, sample justification, and identification of limitations (for example, the PLOS ONE Jaipur study by Ligon et al., 2019, which offered valuable insight into merchant perceptions). Grey literature was appraised based on institutional reliability, stated methodology, and policy scope—particularly for circulars and publications from the RBI, NPCI, BIS, IMF, and World Bank. Industry reports such as those by Worldline India (2024) were used primarily to understand contextual and operational trends rather than to infer causality. Two sensitivity practices were applied throughout the synthesis process: first, descriptive or promotional claims were treated as contextual unless supported by empirical evidence; second, emerging UPI features such as credit-on-UPI or pre-approved credit lines were interpreted cautiously unless validated through merchant-level data. All policy assertions were cross-verified with official RBI/NPCI circulars (2020–2025) to ensure factual accuracy and avoid misinterpretation.

By triangulating academic research, policy documentation, and industry evidence, this systematic review offers a comprehensive, validated understanding of how Indian retailers have experienced and adapted to the UPI ecosystem. The final synthesis of 32 selected studies provides both breadth and depth across empirical, institutional, and operational dimensions, laying the foundation for an integrated perspective on adoption barriers and emerging opportunities for merchants in India's digital payment landscape.

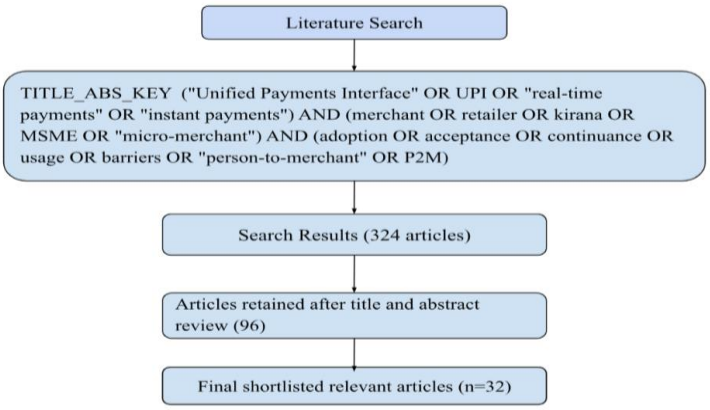

Fig.: PRISMA flow chart of review results

THE STATE OF UPI P2M FOR RETAILERS (Backdrop)

Based on the ecosystem statistics for UPI provided by NPCI, this context focuses on the P2M/P2PM classification as detailed in official dashboards and circulars (NPCI, n.d.; NPCI, 2024b). We cross-reference descriptive patterns with industry summaries (Worldline India, 2024) and analyses of policy and architecture (Cornelli, Frost, Gambacorta, Sinha, & Townsend, 2024; IMF, 2025). Since the NPCI series are not designed as seasonally adjusted research datasets, periodic revisions, updates in definitions, and variations in reporting among participants may occur. Therefore, we consider the series as contextual rather than inferential, examining trends alongside changes in rules and features (RBI, 2022; NPCI, 2020, 2022, 2023, 2024a).

During the post-launch phase, the P2M curve on NPCI dashboards consistently shows an increase in merchant and customer engagement in everyday transactions, reflecting a growing acceptance network (NPCI, n.d.; Worldline India, 2024). Cornelli et al. (2024) note that UPI's interoperable, account-to-account framework and open participation policies simplify the onboarding process for small retailers. This growth is likely bolstered by policy and product advancements: UPI AutoPay has facilitated recurring retail scenarios (NPCI, 2020); the integration of RuPay credit cards with UPI and pre-approved credit lines has expanded offerings beyond traditional debit transactions (NPCI, 2022, 2023, 2025); and streamlined methods have focused on high-frequency, low-value transactions where speed and reliability are essential (NPCI, 2024a). Government incentives for low-value P2M further demonstrate public support for merchant acceptance (Press Information Bureau [PIB], 2025; Department of Financial Services, 2024). Although causality cannot be confirmed from descriptive data, the simultaneous rollout of features and increasing transaction volumes suggest a growing habit of using QR checkouts in daily retail. Meanwhile, evidence from micro-merchants indicates that cash is still used alongside digital payments due to perceived risks, reconciliation efforts, and context-specific reliability (Ligon, Malick, Sheth, & Trachtman, 2019; IFMR LEAD & Catalyst, 2018).

The value series, which should be approached with caution due to the previously mentioned caveats, generally exhibits an upward trend alongside volume, indicating an increase in transactions and a broader range of use cases (NPCI, n.d.; Worldline India, 2024). The integration of UPI at billing counters in organized retail and services likely enhances overall values, while local commerce supports smaller transactions (Worldline India, 2024). Design decisions influence this dynamic: credit on UPI (via card linkage and bank credit lines) enables larger transaction sizes and may facilitate categories where the timing of working capital is crucial, provided that terms and dispute processes are clear (NPCI, 2022, 2023, 2025; RBI, 2022). Conversely, features designed for lightweight or low-value transactions, such as new credit-account functionalities, aim to stabilize very small transactions, collectively impacting the value curve even if the average transaction size remains small (NPCI, 2024a; Cornelli et al., 2024). Observations from different countries on interoperability suggest that as acceptance grows across various sectors, the concentration of value can gradually diversify, although the quality of the merchant experience remains critical for continued use (IMF, 2025; Cornelli et al., 2024). In summary, the value trajectory aligns with an ecosystem where both the frequency and scope of merchant payments are increasing.

On the ground, the widespread use and compatibility of QR codes help reduce acquisition costs, enabling kirana stores and small businesses to adopt them (RBI, 2022; Cornelli et al., 2024). In certain settings, both static and dynamic QR codes are employed alongside audible confirmation devices, enhancing checkout signals for both employees and customers (Sharma & Chauhan, 2025; Worldline India, 2024). Many merchants continue to accept multiple payment methods,using UPI in addition to cash and, when applicable, cards balancing risk and customer preferences as digital transactions increase (Ligon et al.,

2019). The range of use cases now encompasses everyday purchases, subscriptions or recurring payments, and higher-value transactions facilitated by credit links or lines (NPCI, 2020, 2022, 2023, 2025). Newer conversational or lightweight methods aim to enhance reliability for small-value transactions and expand accessibility in limited settings (NPCI, 2024a). This evolving combination sets the stage for the analysis of determinants and barriers in the following section.

ANALYSIS & DISCUSSION: HOW DIFFERENT FACTORS AFFECT RETAILERS' UPI ADOPTION

Merchants frequently stress that reliability acts as the "permission" for all other operations. As noted by Worldline India (2024), fluctuations in daily network performance, delays in confirmations, and occasional app crashes can directly result in queues and lost sales, especially during peak times. In kirana settings, where every second at checkout is noticeable to waiting customers, even minor delays can compel the merchant to revert to cash as a dependable alternative (Ligon, Malick, Sheth, & Trachtman, 2019). Practitioner guides emphasize that the choice of acceptance hardware and software,such as static versus dynamic QR codes, sound or display confirmations, and the QR code's placement at the counter affects the perceived smoothness of the interaction (CGAP, 2019; International Finance Corporation [IFC], 2020). From a systemic perspective, Cornelli, Frost, Gambacorta, Sinha, and Townsend (2024) argued that India's account-to-account, interoperable framework alleviates onboarding challenges, but the retailer's experience ultimately depends on last-mile factors: device quality, connectivity, and app reliability.

Feature design has been focused on tackling these specific challenges. The introduction of UPI AutoPay has simplified recurring retail transactions by reducing manual steps (National Payments Corporation of India [NPCI], 2020). Following this, the creation of credit-on-UPI pathways, which link RuPay credit cards and provide pre-approved credit lines, has added flexibility to sustain digital transactions even when bank account balances are low (NPCI, 2022, 2023, 2025). Simultaneously, credit-account features and other lightweight options have been introduced to stabilize very small transactions, where speed and reliability are crucial for merchants (NPCI, 2024a). Policy documents emphasize reliability as a fundamental aspect, alongside interoperability and inclusion (Reserve Bank of India [RBI], 2022). However, research indicates that many retailers still depend on cash as a backup to guard against local outages or device malfunctions (IFMR LEAD & Catalyst, 2018; Ligon et al., 2019). In conclusion, when confirmations are prompt, disputes are rare, and the QR-scan process is consistent, merchants view UPI as the "default"; if any of these elements fail, the same merchants underscore the importance of cash as a fallback (Worldline India, 2024; IFC, 2020). Thus, reliability is a crucial factor that enhances (or diminishes) the perceived usefulness and ease of use described in traditional adoption theories (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003).

Concerns about fraud and uncertainty regarding resolution are often cited as obstacles to using UPI for everyday transactions. Evidence from micro-merchants in Jaipur reveals that small business owners are wary of issues such as "payment sent but not received," social engineering tactics, and unclear accountability when problems arise (Ligon et al., 2019). CERT-In (2024) identified common digital fraud patterns affecting both customers and merchants, explaining why firsthand experiences might erode trust even as the infrastructure improves. The RBI (2019) sought to establish uniform expectations by defining turnaround times (TAT) and compensation for unsuccessful transactions across authorized systems, including escalation procedures. However, in practice, merchants frequently face a lack of clarity about whom to contact, what documentation is required, and how long the process will take,challenges that are operational rather than structural (IFC, 2020; Worldline India, 2024).

Two notable design trends are emerging. First, product and policy documents are increasingly featuring clearer protocols for handling disputes and refunds (RBI, 2019; Cornelli et al., 2024). Second, confirmation cues such as visual ticks, sound notifications, and printable receipts are being designed to reduce miscommunication at service counters (Sharma & Chauhan, 2025; CGAP, 2019). CGAP (2023) also emphasized the significance of initiation and authentication processes: when these steps are clear and consistent, they enhance perceived security without introducing unnecessary complications. In scenarios involving credit instruments, such as RuPay credit on UPI or bank credit lines, transparency in fees, limits, and dispute resolution is essential for building trust (NPCI, 2022, 2023, 2025). While interoperability and open participation have facilitated widespread adoption, Cornelli et al. (2024) cautioned that consumer protection and dispute resolution must evolve accordingly to maintain consumer confidence.

Generally, the literature suggests a practical link to continuity: when merchants can anticipate the process from incident to resolution, they are more comfortable directing customers to UPI. However, when the process is uncertain, cash remains attractive. Consequently, the trust domain interacts with reliability (quick, clear confirmations), knowledge/skills (understanding how to file and monitor a dispute), and cost (time spent reconciling or seeking compensation) (IFC, 2020; Venkatesh et al., 2003; Worldline India, 2024).

Even with supportive infrastructure, the integration of new systems in small businesses depends significantly on existing human workflows. According to IFMR LEAD and Catalyst (2018), merchants' perceptions, how they view cash flow, timing of settlements, and record-keeping are crucial in determining whether QR codes

become a regular part of operations or remain peripheral. In a field experiment using IVRS, IFMR LEAD (2017) found that simple prompts can encourage initial trials, but sustained use requires training that aligns with the shop's daily operations, such as instructing staff on confirming transactions, processing refunds, and balancing end-of-day accounts. Similarly, CGAP (2019) emphasized the importance of onboarding processes that focus on the placement of devices, customer prompts, and staff scripts during checkout.

Turnover intensifies skill frictions, as small retailers often rely on temporary or rotating staff; when trained employees leave, knowledge gaps resurface (IFC, 2020). In situations where merchants lack systematic record-keeping, reconciliation can appear daunting, and a single negative incident can significantly erode confidence (Ligon et al., 2019). Conversely, when merchants receive straightforward job aids such as laminated instructions, QR code placement guides, and dispute resolution checklists, the barrier to regular use is reduced (IFC, 2020; CGAP, 2019). In organized retail, structured onboarding and in-app tutorials integrated into POS systems help minimize discrepancies across various outlets (Worldline India, 2024).

The theoretical lenses elucidate the significance of these patterns. Perceived ease of use increases when staff have clear instructions, while perceived usefulness is enhanced when reconciliation is straightforward and transparent (Davis, 1989). Social influence is also a factor: local shops demonstrating successful usage encourage adoption within neighborhoods (Venkatesh et al., 2003; Rogers, 2003). Consequently, human-centered onboarding through coaching, clear scripts, and visible confirmations connects system design to frontline practice, helping to explain the persistence or decline in merchant usage (IFMR LEAD & Catalyst, 2018; IFC, 2020).

In the retail sector, where profit margins are narrow, the predictability of costs and the timing of working capital are vital for making adoption decisions. As noted by CGAP (2020), an analysis of pricing strategies for instant payments demonstrated how different models can shift incentives for the smallest merchants. IFC (2020) pointed out the hidden costs that merchants take into account, such as the expense of printer paper, the time staff spend on reconciliation, and the opportunity cost linked to checkout delays. Worldline India (2024) observed that while acceptance has grown, concerns about fees and the transparency of settlements continue to shape merchant views, particularly in semi-urban areas.

Policy tools are designed to address these challenges. The Government of India's incentive program for low-value P2M transactions aims to enhance merchant acceptance in situations where transaction amounts are minimal and profit margins are tight (Press Information Bureau [PIB], 2025; Department of Financial Services, 2024). On the product side, credit on UPI, facilitated through RuPay card linkage and pre-approved credit lines, enables transactions even when customer account balances are low, potentially increasing average purchase sizes in certain categories (NPCI, 2022, 2023, 2025). However, for merchants, these features introduce new considerations, such as understanding fee disclosures, chargeback regulations, and settlement processes for credit instruments (NPCI, 2024a; IFC, 2020). From a policy framework perspective, Cornelli et al. (2024) and the IMF (2025) noted that while interoperability fosters economies of scale, the economics of acceptance at the point of sale determine whether usage becomes sustained.

In practice, retailers propose a compromise: if accepting digital payments reduces friction such as speeding up checkouts and lowering cash-handling costs and the fees remain consistent, the overall advantage favors UPI. However, if reconciliation becomes time-consuming or fees seem unpredictable, merchants often revert to using a mix of methods or cash (IFC, 2020; Worldline India, 2024). This delicate balance ties cost efficiency to process integration and perceived value.

Convenience extends beyond merely reducing steps; it encompasses integration with existing systems. As noted by IFC (2020), integrating QR code acceptance into billing, inventory, and accounting processes reduces the effort needed for reconciliation and decreases the likelihood of errors. Worldline India (2024) discovered that merchants value settlement dashboards and downloadable reports, which convert transaction records into actionable insights, such as tracking cash flow and managing staff. Without these tools, business owners must create their own reconciliation methods, rendering even small transaction volumes administratively taxing. Recent advancements in product development have broadened the spectrum of convenient transaction options. UPI AutoPay has streamlined the process for subscriptions and recurring purchases (NPCI, 2020). The introduction of RuPay credit on UPI and pre-approved credit lines offers a seamless experience during financial constraints, benefiting both customers and merchants, provided settlement transparency is maintained (NPCI, 2022, 2023, 2025). UPI's credit-account features are crafted to enhance these interactions (NPCI, 2024a). From a diffusion perspective, when nearby stores offer integrated QR checkout with clear audio/visual confirmations, adoption is encouraged through observability (Rogers, 2003). The emphasis on interoperability, a consistent theme in policy and international analysis ensures that regardless of the POS or app chosen by the merchant, the customer's app can successfully process the payment (Cornelli et al., 2024; RBI, 2022).

Essentially, merchants adopt and continue using UPI when it integrates seamlessly into their daily operations: a single scan, one confirmation, automatic ledger entries, and straightforward end-of-day reconciliations. The more closely this process aligns with that ideal, the

more UPI competes with cash and cards in terms of convenience (IFC, 2020; Worldline India, 2024).

Customer demand plays a pivotal role in determining how often merchants are asked to accept UPI. The Global Findex report underscores a rise in first-time digital payments during the pandemic, establishing a new norm for electronic transactions in everyday retail (World Bank, 2022). As noted by CGAP (2019), the presence of visible QR codes and clear prompts at checkout encourages customers to choose digital payments. Research on merchants in Jaipur indicates that customer preferences influence merchants' perceptions of risk when customers insist on using QR codes but concerns about chargebacks or failed payments persist, merchants often prefer cash (Ligon et al., 2019).

Initiatives within ecosystems and product features can significantly boost demand. The introduction of Hello! UPI by NPCI, along with related conversational or "tap" experiences, aims to reduce customer effort (NPCI, 2023; NPCI, n.d.-a). Industry analyses indicate that promotions and loyalty programs, though sporadic, serve as effective tools, particularly when tied to specific categories or shopping events (Worldline India, 2024; PwC, 2024). Over time, as customers begin to expect QR codes at checkout, merchants report fewer objections to promoting UPI provided that reliability and clear dispute resolution are ensured (IFC, 2020; Cornelli et al., 2024). Consequently, customer demand only enhances ongoing use when it aligns with the operational realities mentioned above.

The policy framework shapes merchant incentives, onboarding procedures, and operational stability. The RBI's Payments Vision 2025 highlights interoperability, security, and inclusion as key strategic elements (RBI, 2022). NPCI's operational guidelines specify the regulations: RuPay credit on UPI (NPCI, 2022), pre-approved credit lines and their supplements (NPCI, 2023, 2025), credit-account functionalities (NPCI, 2024a), and inward credit limits for P2PM merchants (NPCI, 2024b). These initiatives impact KYC/AML standards, transaction sizes, risk management, and the approach acquirers take towards onboarding micro-merchants. Government incentives for low-value P2M transactions further illustrate a policy commitment to supporting acceptance at the smallest retail outlets (Department of Financial Services, 2024; PIB, 2025).

Analyses of architecture underscore that institutional design encompassing standardized QR codes, open participation, and public infrastructure enables scalability but requires the concurrent development of consumer-protection processes (Cornelli et al., 2024). SUERF's review of the UPI experience highlights that clear rules and predictable enforcement are as vital as technological capabilities (Cornelli, Frost, Gambacorta, Sinha, & Townsend, 2024). Practically, the institutional framework sets a baseline (what is feasible and secure) and a limit (how far merchants will proceed without additional support). Awareness campaigns and brand-display regulations bolster these standards by ensuring that acceptance is both visible and consistent at the point of sale (NPCI, 2024b; RBI, 2022).

The body of evidence consistently highlights diversity. Structured retail operations benefit from integrated point-of-sale systems and training protocols, resulting in smoother transactions and quicker reconciliation (Worldline India, 2024). In contrast, kirana stores and micro-merchants face higher turnover and variability in device quality, making reliability and clarity in disputes essential (IFMR LEAD & Catalyst, 2018; Ligon et al., 2019). Urban outlets experience a higher demand for UPI, while rural and semi-urban shops are more affected by connectivity issues and the reliability of small-value transactions, prompting a shift towards lightweight solutions (NPCI, 2024a; RBI, 2022). The sector plays a role: grocery and pharmacy sectors tend to have frequent, low-value transactions, whereas electronics and apparel involve less frequent, higher-value transactions, where UPI credit may be more significant (Worldline India, 2024; NPCI, 2022, 2023). The size of the firm accentuates these differences, with larger chains incorporating reconciliation and analytics, while smaller shops rely on simple job aids and local peer learning (IFC, 2020; Rogers, 2003).

LIMITATIONS OF THIS STUDY

This review relies on secondary sources. While administrative dashboards and circulars clarify rules and provide context for the ecosystem, they are not designed to function as seasonally adjusted research datasets. Definitions may evolve over time (e.g., P2M/P2PM classifications), and updates are periodically made (National Payments Corporation of India [NPCI], n.d.; RBI, 2022). Consequently, descriptive series are regarded as background information rather than evidence of causality, and any concurrent changes between features and outcomes are approached with caution (Worldline India, 2024; Cornelli, Frost, Gambacorta, Sinha, & Townsend, 2024).

The body of evidence is varied, with studies differing in design (such as surveys, small-scale field experiments, and practitioner notes), constructs (like adoption, continuance, and intensity), and measurement methods (self-reports versus transaction logs), which makes direct comparisons and meta-aggregation challenging (IFC, 2020; CGAP, 2020). A significant portion of the peer-reviewed research is cross-sectional, with causal identification being rare. An exception is a light-touch IVRS trial that focuses on initiation rather than long-term continuance (IFMR LEAD, 2017), while observational studies from Jaipur highlight perception and workflow effects without experimental leverage (Ligon, Malick, Sheth, & Trachtman, 2019). Consequently, causal inference is limited, and claims are expressed in terms of association and plausibility.

Geographical and typological disparities exist in the research on micro-merchants, which is predominantly

focused on a few urban areas, leaving rural and sector-specific dynamics underexplored. Although industry reports are systematic, they often reflect the perspectives of large acquirers and may not fully capture the informal segments (Worldline India, 2024). Furthermore, the policy and product landscape is evolving, with features like credit on UPI and related developments (2022–2025) being too recent for comprehensive peer-reviewed analysis (NPCI, 2023, 2025; IMF, 2025). Therefore, this synthesis should be seen as a theory-driven map that highlights patterns and gaps, rather than a definitive assessment of effects.

SCOPE OF FURTHER RESEARCH

Future research should advance beyond mere descriptive analyses to encompass comprehensive multi-site longitudinal and causal studies. These studies should track merchants before and after they experience specific interventions, such as onboarding scripts, dispute resolution tools, and product features. The studies conducted in Jaipur primarily highlighted perceptions and challenges but were largely cross-sectional, while a limited IVRS trial concentrated on initiation rather than ongoing engagement (IFMR LEAD, 2017; Ligon, Malick, Sheth, & Trachtman, 2019). Researchers are encouraged to evaluate the timelines for the occurrence and resolution of disputes or fraud using standardized definitions that align with current norms, and to link these to merchant outcomes, such as the proportion of repeat UPI transactions and checkout duration (CERT-In, 2024; Reserve Bank of India [RBI], 2019).

A secondary focus involves conducting randomized or quasi-experimental evaluations of reconciliation tools such as dashboards, POS-accounting integrations, and confirmation aids to assess their effectiveness in reducing administrative costs and improving continuity (CGAP, 2019; International Finance Corporation [IFC], 2020). Furthermore, rural and sector-specific development paths necessitate stratified research that combines reliability constraints with format variations (kirana versus organized), especially in contexts where lightweight methods are intended to be advantageous (National Payments Corporation of India [NPCI], n.d.-b; RBI, 2022; Worldline India, 2024).

Fourth, there is an opportunity to thoroughly assess the effects of fee structures and incentives through natural experiments or difference-in-differences, leveraging policy changes related to low-value P2M and pricing (CGAP, 2020; Department of Financial Services, 2024; Press Information Bureau, 2025). Fifth, evaluate the impact of credit-on-UPI pathways, such as RuPay linkage and pre-approved credit lines, on factors like basket size, working capital, and repayment behavior, ensuring that fees and dispute rules are transparently addressed (NPCI, 2022, 2023, 2025). Lastly, explore how merchants perceive privacy and data-sharing within India's institutional framework to ensure that protection measures scale appropriately (Cornelli, Frost, Gambacorta, Sinha, & Townsend, 2024; RBI, 2022). Across these studies, employing common constructs from TAM/UTAUT would enhance comparability and contribute to theoretical development (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003).

CONCLUSION

Overall, the evidence from India highlights a payment system that has swiftly expanded into the retail sector while still tackling the practical challenges of in-store usage. The UPI's interoperable, account-to-account design, coupled with its policy focus on inclusivity, has lowered entry barriers and broadened P2M applications across various formats (Cornelli, Frost, Gambacorta, Sinha, & Townsend, 2024; Reserve Bank of India [RBI], 2022; National Payments Corporation of India [NPCI], n.d.). However, merchants continue to weigh adoption and ongoing use against several primary challenges: reliability at the point of sale, the clarity and speed of issue resolution, the integration of onboarding with staff routines, and the financial aspects of reconciliation and fees (Worldline India, 2024; RBI, 2019; IFMR LEAD & Catalyst, 2018; CGAP, 2020; International Finance Corporation [IFC], 2020). The most effective strategies lie at the intersection of ecosystem design and management practices: creating lightweight and resilient processes for small transactions; establishing transparent and predictable dispute resolution pathways; integrating POS with accounting systems and providing simple dashboards; and clearly communicating fees and limits especially when UPI credit extends transaction sizes or working-capital options (NPCI, 2020, 2022, 2023, 2024a, 2025; IFC, 2020). Government incentives for low-value P2M transactions and a continued focus on interoperability support these efforts, but long-term success hinges on whether everyday interactions are perceived as fast, safe, and easy by both staff and customers (Department of Financial Services, 2024; Press Information Bureau, 2025; IMF, 2025). Essentially, India has the infrastructure for widespread merchant acceptance; turning this infrastructure into routine practice requires close coordination among policymakers, NPCI, banks/TPAPs, and retailers aligning regulations, products, and in-store processes so that UPI becomes the standard at checkout (Cornelli et al., 2024; Worldline India, 2024).

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