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UPI as a Catalyst for Inclusive and Sustainable Digital Payments

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Abstract

India's Unified Payments Interface (UPI) has evolved from a domestic real-time rails experiment in 2016 into the world's most heavily used instant payments system by 2024-25, adding offline, credit-line, feature-phone and cross-border capabilities along the way. This paper reviews the evolution of UPI (and the role of NPCI), synthesizes recent literature, and analyzes the latest usage patterns and product innovations (UPI Lite/Lite X, Tap & Pay, Credit Line on UPI, RuPay credit on UPI, 123PAY, autopay mandates), as well as international linkages (Singapore, UAE, Nepal, France, Sri Lanka and Mauritius). Using NPCI product statistics through July 2025 and official releases, we show UPI's monthly volume reached 19.47 billion and value ₹25.08 lakh crore in July 2025, with UPI accounting for ~84% of retail payment volumes in FY2024–25 per RBI reporting. We discuss sustainability debates around MDR, merchant category dynamics, and the implications of cross-border acceptance. Findings suggest UPI's next growth leg will hinge on credit line activation, offline/feature-phone reach, risk controls, and pragmatic international standards alignment.

Keywords: UPI, RBI, Foreign Investments, NPCI

INTRODUCTION

FROM IDEA TO RAIL: UPI'S EVOLUTION

Conceived under the Reserve Bank of India (RBI) and the Indian Banks' Association's umbrella entity—the National Payments Corporation of India (NPCI)—UPI launched in 2016 to enable inter-bank, account-to-account transfers via virtual identifiers and QR codes. NPCI (incorporated in 2008) operates the retail payment systems backbone in India (including RuPay, IMPS, AePS, NACH, NETC). UPI's open API architecture and interoperability catalyzed third-party app innovation and mass merchant acceptance.

NPCI's role and the "India Stack" context

NPCI's stewardship-standards, risk rules, settlement, and certification-combined with Aadhaar e-KYC, e-sign, and digital public infrastructure, allowed seamless onboarding and ubiquitous QR acceptance. The literature attributes UPI's scale to policy design (zero end-user fees, interoperability), developer-friendly standards, and competitive third-party application providers (TPAPs).

A dynamic, globalizing system

UPI crossed multiple adoption thresholds: billions of monthly transactions, features beyond basic push/pull payments, and international acceptance pilots. In February 2023 India–Singapore's PayNow–UPI real-time linkage launched; in 2024 UPI went live in Sri Lanka and Mauritius; acceptance started in France (Eiffel Tower and other merchants), and expanded in the UAE via NEOPAY/Network International. These moves point toward a travel-payments and remittance future for UPI. Where UPI stands in 2024–25 NPCI's official dashboard shows record highs through late 2024 and 2025; July 2025 saw 19.47 billion transactions worth ₹25.08 lakh crore. RBI's 2024–25 reporting notes UPI at ~84% of retail digital payment volumes (≈186 billion transactions in FY25). Global comparisons place India as the largest real-time payments market by volume, contributing roughly half of global instant transactions.

Need of the Study

Despite rapid adoption, several questions remain under-researched: (i) the sustainability of a zero-MDR model and ecosystem incentives, (ii) adoption and efficacy of new features (Lite/Lite X, Tap & Pay, Credit Line on UPI, 123PAY) in reducing system load and improving resilience, (iii) merchant category concentration and ticket sizes, and (iv) the practical evolution of cross-border acceptance, regulatory compliance, and travel-rule alignment.

Scope of the Study

This paper covers UPI's recent trends between January 2023 and August 2025, emphasizing product updates, ecosystem rules, usage metrics, merchant-category insights, and cross-border expansion. It synthesizes public data (NPCI/RBI/MAS/press releases) and peer-reviewed/official studies (BIS, ACI Worldwide).

Importance of the Study

Understanding UPI's newest features, volumes, and regulatory trajectory helps policy makers calibrate incentives (e.g., MDR), helps banks/fintechs prioritize integrations (credit lines, NFC, offline flows), and helps merchants and travelers prepare for wider international acceptance and compliance.

Research Methodology

A descriptive, mixed-methods review was undertaken:

- Data sources: NPCI product/ecosystem statistics, RBI Annual Report highlights, and government/central bank releases; triangulated with reputable media and BIS/ACI research.
- Period: Jan 2023–Aug 2025.

● Approach: Time-series reading of NPCI volumes/values; feature-timeline mapping; and cross-border milestones.

● Limitations: Some third-party articles may summarize primary sources; where possible we privilege official statistics and circulars.

Review of Literature

1. BIS - Organisation of Digital Payments in India (Cornelli et al., 2024).

This BIS chapter analyzes how UPI's governance (NPCI), open APIs, and bank-fintech competition lowered switching costs and created powerful network effects. It shows why India's retail payments are overwhelmingly small-ticket and how UPI captured the lion's share of volumes. The paper also discusses fraud/risk controls and the role of real-time settlement in resilience. For policymakers abroad, it frames UPI as a replicable blueprint when paired with digital public infrastructure.

2. UPI in global "faster payments" context (BIS Papers No. 152, 2024).

This BIS volume compares regions and identifies common success patterns: interoperability, identity rails, and central governance. India's UPI chapter stands out for scale and breadth of use-cases (P2P, P2M, recurring). It also notes trade-offs - zero-MDR incentives vs. ecosystem sustainability and bank core-load management - providing a nuanced view of long-run policy choices.

3. PayNow–UPI cross-border linkage (MAS, 2023).

The MAS release documents the first cloud-scaled real-time link between national systems, enabling account-to-account payments using mobile numbers/VPAs. It highlights instant settlement, cost reduction, and consumer UX continuity across countries. The linkage demonstrates technical and regulatory coordination that future corridors can emulate (AML/CFT, addressing).

4. Leadership perspective on cross-border (PMO Singapore, 2023).

PM Lee's remarks at launch explain the economic rationale - cheaper remittances for workers/students, easier B2C refunds, and tourist payments - while preserving safety. It underscores how addressing systems (phone/UPI ID) lower frictions. The speech helps situate PayNow - UPI within a broader strategy of interoperable regional rails.

5. RBI Annual Report highlights (FY25 via Medianama, 2025).

Coverage of RBI's report notes UPI's dominance- about 84% of India's retail digital payment volumes and ~186 billion transactions in FY25 - placing its scale in historical context. It discusses CBDC pilots, fraud trends, and the policy mix that coexisted with UPI's growth. These figures benchmark recent acceleration and direction-of-travel for regulators.

6. ACI Worldwide—Prime Time for Real-Time 2024.

The global benchmarking study shows India as the world's largest real-time payments market and argues growth is structural, not a pandemic blip. It connects real-time rails to macro outcomes: cash displacement, SME digitization, and productivity. India's share of global instant transactions and five-year CAGR projections contextualize UPI internationally.

7. PIB - record month and state of adoption (Oct 2024).

PIB reports 16.58 billion transactions (₹23.49 lakh crore) in Oct-2024, a 45% YoY surge, with 632 banks on UPI. The release underlines mainstreaming across bill pay, transit, and small merchants, and shows how QR ubiquity sustains compounding network effects. It's a primary marker of step-change usage pre-2025.

8. NPCI - UPI Lite & Lite X (2023–25).

UPI Lite moves sub-₹1000 payments off core banking, while Lite X enables offline NFC transfers both designed to ease peak-load stress and improve reliability in low-connectivity contexts. The product notes clarify risk limits and flow logic (debit from Lite balance, instant credit at receiver). These features target the "last 50 meters" of user experience and resilience.

9. NPCI - Tap & Pay via NFC (2023).

The operating circular formalizes proximity payments on UPI through NFC-capable devices, complementing QR at high-throughput POS. It specifies device/app compliance and risk controls. This shift is material for transit, organized retail, and quick-service formats where speed and reliability are critical.

10. NPCI - Pre-sanctioned Credit Line on UPI (Sep 2023).

UPI expanded from deposit-linked transfers to credit line access at banks, enabling BNPL-like experiences on ubiquitous rails. The circular sets roles for issuer banks, apps, and customer consent flows. If scaled, this can pivot UPI from pure payments to credit-led commerce- a key frontier for merchant monetization.

11. Cross-border expansion - policy and corridors (MAS portal, 2021–23).

MAS's corridor page tracks the timeline from intention (2021) to go-live (2023), detailing principles for interoperability and safeguards. It frames the link as a template: reciprocal limits, strong authentication, and clear addressing—the elements needed for other pairings (e.g., UAE, France acceptance pilots).

12. Media/think-tank synthesis of milestones (ThePrint, 2024).

ThePrint's analysis, drawing on PIB data, emphasizes the pace of adoption and monthly peaks, making the macro story legible for general audiences and decision-makers. It underscores QR ubiquity and merchant onboarding as crucial levers for sustained growth, while hinting at capacity and sustainability debates.

13. IMF-linked coverage on cash displacement (2025).

Recent coverage of an IMF paper indicates UPI's surge correlates with reduced cash usage (ATM withdrawals/currency-GDP ratios), signaling behavioral change in both consumers and businesses. This supports the thesis that real-time rails don't just digitize payments—they alter money-use habits and the cost structure of commerce.

14. International commentary—system exportability (FT, 2025).

The Financial Times positions UPI as a model for advanced economies, citing daily transaction scale and inclusion gains. It links the rails to broader capital-market participation (SIPs, IPOs), suggesting payments infrastructure can catalyze downstream financial behaviors. The piece gives a macro-development lens on UPI's spillovers.

15. Market sustainability and MDR debate (2025).

Coverage in mainstream outlets traces policy discussions on introducing merchant discount rates for large merchants to strengthen ecosystem economics. The debate matters for bank/app incentives, risk investment, and feature rollout pace (e.g., credit lines). It also highlights how maturing systems revisit initial pricing choices.

Data Analysis

UPI Monthly Volumes and Values (latest 10 months shown)

Table 1.

Month	Banks Live	Volume (billion)	Value (₹ lakh crore)
Jul-2025	684	19.47	25.08
Jun-2025	675	18.40	24.04
May-2025	673	18.68	25.14
Apr-2025	668	17.89	23.95
Mar-2025	661	18.30	24.77
Feb-2025	653	16.11	21.96
Jan-2025	647	16.996	23.48
Dec-2024	641	16.73	23.25
Nov-2024	637	15.48	21.55
Oct-2024	632	16.58	23.50

Source: NPCI UPI Product Statistics.

Interpretation:

The data highlights a consistent growth pattern in both the volume and value of UPI transactions over the past ten months. The number of banks live on UPI has steadily increased from 632 in October 2024 to 684 in July 2025, reflecting expanding adoption and deeper penetration of digital payments across financial institutions.

In terms of transaction volume, the figures show a rising trend, growing from 15.48 billion in November 2024 to a record 19.47 billion in July 2025. This indicates the increasing preference of consumers and businesses for UPI as a convenient, real-time payment system.

Similarly, transaction values have surged significantly, fluctuating between ₹21.55 lakh crore (Nov 2024) and ₹25.14 lakh crore (May 2025)**,** before stabilizing at ₹25.08 lakh crore in July 2025**.** These variations suggest seasonal spending patterns, with spikes during periods like the financial year-end (March) and post-festival months (May–July).

Feature Timeline and Policy Updates Affecting UPI (2022–2025)

Table 2.

Feature/Rule	What It Does	Launch/Update Window	Likely Impact
UPI 123PAY	Feature-phone UPI (IVR/app/missed call/sound)	Mar 2022 (ongoing)	Deepens inclusion beyond smartphones/4G.
UPI Lite	PIN-less small-value transactions	2022–23	Reduces CBS load; faster micro-payments.
UPI Lite X	Offline (NFC) small-value transfers	2023–24	Works in low/no connectivity; improves resilience.
UPI Tap & Pay	NFC-based proximity payments	2023+	Faster checkout; complements QR flows.
Credit Line on UPI	Pre-sanctioned credit via UPI	Sep 2023 (rules refined 2025)	Unlocks credit-led use cases/BNPL-like flows.
MDR Debate	Possible MDR for large merchants	2025 (policy in discussion)	Ecosystem revenue sustainability.

Interpretation:

The introduction of UPI Tap & Pay and Credit Line on UPI highlights a shift toward innovation and credit-driven growth. Tap & Pay complements QR-based payments, ensuring faster checkouts in retail environments, while credit lines integrate BNPL-like services, expanding UPI's role beyond simple fund transfers to credit-enabled commerce.

However, the ongoing MDR (Merchant Discount Rate) debate signals a balancing act between keeping UPI free/affordable for users and ensuring long-term sustainability for payment providers. The upcoming policy discussions in 2025 will be critical for shaping ecosystem economics.

Cross-Border & International Acceptance Milestones

Table 3.

Corridor / Country	Instrument	Status / Milestone	Notes
Singapore	PayNow–UPI	Live since Feb 21, 2023	Account-to-account cross-border, mobile/VPA addressing.
Sri Lanka & Mauritius	UPI; RuPay (MU)	Launch Feb 12, 2024	Travel payments; RuPay issuance in MU.
France	UPI at Eiffel Tower; major retail	2024	NIPL–Lyra; extended to Galeries Lafayette.
UAE	Merchant acceptance (NEOPAY/Network Intl.)	2024 (expanding)	UPI apps usable at terminals for Indian visitors.
Nepal	UPI–Fonepay QR	2023–25 (live for Indian users)	Indian users pay Nepali merchants; reciprocal in pipeline.

Interpretation:

International acceptance is targeted at travel and retail. While corridors are expanding, scaling hinges on AML/CFT compliance alignment (e.g., FATF "travel rule"), merchant onboarding, and consumer discovery.

Conclusion

The Unified Payments Interface (UPI) has transformed India's digital payments landscape, evolving from a simple peer-to-peer system in 2016 into a comprehensive platform driving both domestic and international transactions by 2025. The consistent rise in transaction volume and value reflects UPI's increasing role in everyday commerce, financial inclusion, and business adoption. Product innovations such as UPI Lite, Lite X, Tap & Pay, and Credit Line on UPI have enhanced speed, resilience, and accessibility, particularly for micro-payments and underserved users.

Cross-border linkages with countries like Singapore, UAE, Sri Lanka, Mauritius, France, and Nepal highlight UPI's potential as a global model for real-time payments. However, challenges remain around ecosystem sustainability, particularly with the Merchant Discount Rate (MDR) debate, and the need for robust risk management. Looking forward, the focus must be on scaling credit-enabled use cases, ensuring system reliability during peak loads, and harmonizing international standards for cross-border compliance.

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