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UPI and digital payment system in India: Challenges and emerging opportunities

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Abstract
The Unified Payments Interface (UPI) is an innovative real-time digital payment system introduced by the National Payments Corporation of India (NPCI), functioning under the oversight of the Reserve Bank of India (RBI) and the Indian Banks' Association (IBA). Officially launched in April 2016, UPI allows instant inter-bank fund transfers through mobile platforms, playing a crucial role in India's shift towards a cashless economy as part of the broader Digital India initiative. The rapid and widespread adoption of UPI has been driven by a combination of factors: government initiatives promoting a 'less-cash' economy following demonetisation in 2016, the proliferation of affordable smartphones and low-cost mobile data, aggressive marketing by fintech players and banks, and the sheer convenience of scan-and-pay or number-based transfers. Unlike traditional banking channels, UPI eliminates the friction associated with beneficiary account details, settlement delays, and transaction charges for small-value payments, making it attractive not only for large purchases but also for micro-transactions such as buying vegetables from a street vendor or paying for a cup of tea. This study examines the growth, opportunities, and challenges of UPI as a digital payment service in India.

Keywords: Cardless cash services, financial & banking disincentives, National Payments Corporation of India (NPCI), security & cyber fraud, Unified Payments Interface (UPI)

Introduction

India's payment landscape has undergone a dramatic transformation over the last decade, moving steadily away from cash-dominated transactions towards a digitally enabled, real-time payment ecosystem. At the centre of this transformation lies the Unified Payments Interface (UPI), an instant, mobile-based payment system developed by the National Payments Corporation of India (NPCI) and launched in 2016. UPI allows individuals to link multiple bank accounts to a single mobile application, enabling instant fund transfers, merchant payments, bill settlements, and peer-to-peer transactions around the clock, without the need for card swipes, cheque books, or physical cash. What began as a niche innovation for urban, tech-savvy users has, within a few years, become the backbone of India's retail digital payment infrastructure, processing billions of transactions every month across metropolitan cities, small towns, and rural markets alike.

UPI is now one of the most preferred payment solutions in India, with over a billion transactions every month. It is a user-friendly, real-time payment solution that facilitates inter-bank transactions and enables greater digital payments adoption in the country. Its core function is to support easy and secure money transfers between bank accounts. UPI allows users to add multiple bank accounts into a single mobile application, making fund transfers and merchant payments seamless from one place. Additionally, UPI enables 'peer to peer' and 'peer to merchant' collection requests that can be scheduled and paid as requested. Payments can be made using a UPI ID, UPI Number, Account number, and an Indian Financial System Code (IFSC). Payment security is ensured as per applicable RBI guidelines using a 1-click 2-factor authentication, where the second factor of authentication is the UPI PIN. UPI is also available through the Unstructured Supplementary Services Data (USSD) channel to cater to users of feature phones.

The rapid and widespread adoption of UPI has been driven by a combination of factors: government initiatives promoting a 'less-cash' economy following demonetisation in 2016, the proliferation of affordable smartphones and low-cost mobile data, aggressive marketing by fintech players and banks, and the sheer convenience of scan-and-pay or number-based transfers. Unlike traditional banking channels, UPI eliminates the friction associated with beneficiary account details, settlement delays, and transaction charges for small-value payments, making it attractive not only for large purchases but also for micro-transactions such as buying vegetables from a street vendor or paying for a cup of tea. The COVID-19 pandemic further accelerated this shift, as contactless payments became a public-health necessity rather than merely a matter of convenience.

Key Milestones in the Evolution of UPI

The Unified Payments Interface (UPI) was developed by the National Payments Corporation of India (NPCI) under the guidance of the Reserve Bank of India (RBI). It evolved from a modest pilot launch into the world's largest real-time retail payment network. Over the past decade, UPI has evolved into the backbone of India's digital payments ecosystem. Following are some of the key milestones in the evolution of UPI:

- **2016:** UPI was launched on a pilot basis in April 2016 with 21-member banks. In August 2016, it was rolled out to the public as participating banks made their UPI-enabled mobile applications available on the Google Play Store. The BHIM application was launched in December 2016 to enable digital payments using UPI. It allows users to make direct bank-to-bank transactions through mobile devices.

- **2017:** Dynamic QR, a retail merchant platform enabling UPI payments via dynamic QR codes was launched, which dynamically included transaction specifics like payee info and exact totals, removing manual amount entry.

- **2018:** UPI 2.0 was introduced with enhanced features to make digital payments simpler, more secure and seamless. Invoice in the Inbox allows users to view bills or invoices before authorising payments. Signed Intent and QR enables simplifies payment authorisation while maintaining security. UPI Mandates enables recurring payments through pre-authorised instructions. Overdraft account linking allows users to make UPI transactions using their overdraft accounts.

- **2019:** SEBI allowed retail individual investors to use UPI as an alternative payment mechanism when applying for IPOs through designated intermediaries. UPI crossed the milestone of one billion transactions in a month in October 2019, reflecting rapid nationwide adoption.

- **2020-2022:** UPI AutoPay was launched to support recurring e-mandates for subscriptions, utility bills, insurance premiums, SIPs and EMIs. Feature phone users were brought into the digital payments' ecosystem through the launch of UPI 123PAY. It allows transactions through interactive voice response (IVR) number, app-based functionality, missed calls-based approach and proximity sound-based payments. UPI Lite was introduced to enable low-value transactions in a faster and PIN-less manner. The integration of credit cards with UPI further expanded digital payment options for users. During FY 2021 [14]-22, UPI processed transactions worth over US$1 trillion and crossed 5 billion monthly transactions in March 2022. It also expanded internationally with its launch in Bhutan, marking its first cross-border deployment.

- **2023:** Credit Line on UPI was introduced, allowing pre-sanctioned bank credit lines to be linked as a funding account. UPI accounted for ~70% of India's digital payment transactions during FY 2023–24.

- **2024:** UPI Circle was introduced, enabling primary users to authorise secondary users with predefined transaction limits on the primary user's bank account. RBI enhanced the UPI transaction limit for tax payments from ₹1 lakh to ₹5 lakh per transaction. Higher limits also apply to select categories, including capital markets, IPO subscriptions, loan collections, insurance, healthcare and education. The per-transaction limit for UPI 123Pay was raised to ₹10,000, expanding its range of use cases. The UPI Lite wallet limit was increased to ₹5,000, with the per-transaction limit raised to ₹1,000.

- **2025:** On-device authentication for UPI was introduced, enabling payments through smartphone fingerprint or face unlock. Aadhaar-based Face Authentication simplified UPI PIN onboarding, especially for first-time users, senior citizens and those without easy access to cards.

- **UPI Today:** UPI has witnessed unprecedented growth in both transaction volume and value, reflecting its widespread adoption by individuals, businesses and financial institutions.

From FY 2016-17 to FY 2025 [16]-26

- Annual transaction volume increased from 2 crore transactions to over 24,162 crore transactions. It represents ~12,000-fold increase.
- Annual transaction value grew from ₹0.07 lakh crore to ~₹314 lakh crore, recording more than 4,000-fold increase.

UPI has transformed the scale and reach of digital payments in India. In July 2026 [13]

- The UPI ecosystem comprises 741 live banks, reflecting its widespread adoption across India's banking sector.
- UPI processed 2,365.8 crore transactions; and
- Total transaction value stood at ₹29.87 lakh crore.

UPI's Global Reach

UPI has emerged as a leading real-time payment system globally. As of 2024 [12], UPI accounted for ~49% of global real-time payment transaction volume. This achievement was highlighted by the International Monetary Fund (IMF) in its "Growing Retail Digital Payments: The Value of Interoperability" report, published in June 2025 [16].

UPI's Global Footprint Continues to Expand

- UPI is operational in Bhutan, Nepal, Singapore, the UAE, France, Sri Lanka, Mauritius and Qatar, enabling seamless cross-border digital payments.
- In June 2026, NPCI International Payments Limited partnered with ACLEDA Bank Plc. to launch UPI acceptance in Cambodia, further strengthening India's cross-border digital payment connectivity
- In June 2026, UPI went Live in **Greece** for Cross Border Remittances, where eligible customers can transfer money instantly, securely, and seamlessly between Greece – India (through Eurobank).
- On 30 th July 2026, Cross Border Remittances between the Maldives Instant Payment System, 'Favara', and India's UPI went live, marking a transformative milestone in cross-border digital financial connectivity and bilateral economic cooperation between the Maldives and India.
- As on date, UPI is live in 11 foreign countries for UPI Acceptance and/or Cross Border Remittances.

Impact of UPI on Daily life

The Unified Payments Interface (UPI) has fundamentally transformed everyday life in India by replacing cash and cards with instant, smartphone-based transactions.

- **Money Anytime, anywhere:** No need to stand in queues or wait for bank hours. UPI lets people send or receive money instantly, 24x7, right from their mobile phones.

- **One App for All Accounts:** Managing money is simpler. People can link all their bank accounts in one app instead of juggling multiple platforms.

- **Safe and Quick Payments:** With secure two-step authentication, payments happen in seconds without compromising safety.
- **Privacy First:** Users no longer share sensitive bank details. A simple UPI ID is enough, reducing risks for everyone.
- **QR Code Convenience:** Paying with UPI is as simple as scanning a QR code. This helps speed up transactions at shops and service points.
- **No More Cash-On-Delivery Hassles:** Online shopping becomes easier as UPI replaces the need to keep exact change for deliveries.
- **Payments for Everything:** People can now pay bills, donate, or recharge phones without stepping out of their homes.
- **Help Is Just a Tap Away:** Any issue with a payment can be reported directly in the app, making grievance redressal easy

Present Status of UPI

Over a decade of operations, UPI has demonstrated extraordinary scale and momentum. Annual transaction volume expanded from just 2 crore transactions in FY 2016-17 to over 24,162 crore transactions in FY 2025-26, representing an almost 12,000-fold surge in transaction volume. Parallelly, transaction value rose sharply from ₹0.07 lakh crore in FY 2016-17 to approximately ₹314 lakh crore in FY 2025-26, translating into a more than 4,000-fold increase in transaction value.

UPI At A Glance: Key Statistics (NPCI)	
Annual Transaction Volume (FY2025-26)	24,161.69 Crore
Annual Transaction Value (FY2025-26)	₹314 Lakh Crore
YoY Volume Growth (2025 [5]-2026)	30.0%
YoY Value Growth (2025 [5]-2026)	20.59%
Daily Average Transactions (2025)	66 Crore
Record Monthly Volume (March 2026)	2264 Crore (peak)
Record Monthly Value (March 2026)	₹29.53 Lakh Crore
Banks Live on UPI (As on March 2026)	703 Banks
Banks at Launch (April 2016)	21 Banks
First Month Transactions (April 2016)	373
Share of UPI in India's Digital Payments	85% (FY2025-26)
Share of Global Real-Time Volume	49% of World (2025)

Emerging Opportunities

India's Unified Payments Interface (UPI) is expanding beyond basic peer-to-peer and merchant payments into high-growth financial and technological sectors.

- **Micropayments & UPI Lite:** Using on-device wallets with auto-top-up capabilities to handle small-ticket transactions instantly without hitting core banking servers or suffering from network latency.
- **Offline & Feature Phone Solutions (UPI 123Pay):** Reaching unconnected or rural demographics through interactive voice response (IVR) and missed-call-based digital payments.
- **Delegated Spending & Family Budgets (UPI Circle):** Allowing primary account holders to delegate secondary spending power or manage sub-accounts for family members or staff.
- **Credit Lines & BNPL Integration:** Embedding pre-approved bank credit lines and RuPay credit cards directly into the UPI flow, bypassing traditional point-of-sale (PoS) card hardware.
- **Cardless Cash Services (UPI ATMs):** Enabling cash withdrawals and deposits via QR code scans on Android-powered ATM kiosks.
- **Global Expansion & Cross-Border Remittances:** Expanding real-time payment acceptance and remittances across international corridors like Singapore, the UAE, France, Bhutan, Nepal, Sri Lanka, Mauritius, Qatar, Cambodia, Greece, and the Maldives.
- **Next-Gen Tech Integration:** Adopting biometric face and fingerprint authentications, voice-enabled payments, wearable smartwatches, open banking, and blockchain verification.

Challenges of UPI

Unified Payments Interface (UPI) faces several operational, financial, and security challenges despite its massive growth:

- **Infrastructure & Technical Reliability**
- **Single Point of Failure (SPoF):** Most UPI traffic relies heavily on the centralized switch managed by the National Payments Corporation of India (NPCI). Disruptions at NPCI or peak server overloads can impact millions of users across various apps.
- **Transaction Failures & Latency:** Unstable rural networks, high-volume traffic spikes, and slow bank-server responses can cause delayed refunds or failed transactions.
- **Internet & Device Dependency:** While offline solutions like UPI 123PAY exist, standard UPI still largely depends on a steady smartphone and internet connection.
- **Financial & Banking Disincentives**
- **Zero MDR Policy:** The zero Merchant Discount Rate (MDR) policy means banks and payment service

providers earn little to no direct fee on standard peer-to-peer or small merchant transactions while still bearing running and infrastructure costs.

- **Monetization Pressures:** To help sustain the system, guidelines and selective merchant fees (such as a 0.4% MDR on higher-value retail transactions above ₹2,000 for larger businesses) have been introduced, though they spark ongoing debate among retailers.

- **Security & Cyber Fraud**
- **Social Engineering & Phishing:** Users frequently fall victim to phishing links, fake customer support numbers, SIM-swapping, and malicious apps.

- **Account Freezing Issues:** In cyber-fraud investigations, entire user or small-merchant bank accounts can get frozen downstream by law enforcement when tainted funds touch them, causing major disruptions for innocent users.

- **Digital Literacy & Awareness Gaps**
- **Urban vs. Rural Divide:** UPI awareness is significantly higher in urban areas (~92%) compared to rural pockets (~62%), particularly among older demographics (>50 years).

- **Complex Multi-Step Flows:** Entering PINs, verifying handles, and managing multi-account interfaces can still intimidate first-time or digitally illiterate users.

- **Transaction & Value Limits**
- **Capped Volumes:** Standard UPI transactions are generally restricted to ₹1 lakh per day per user (with variations up to ₹2 lakh–₹5 lakh for specific categories like capital markets, hospitals, or tax payments), which can feel restrictive for high-value commercial transfers.

Summing-up

The study reveals that the rapid expansion of UPI in India has led to significant changes in financial behaviour and contributed to inclusive economic development. The statistical analysis indicates a strong growth in UPI transactions from 2017 to 2026, reflecting a clear shift from cash-based payments to digital transactions. The decline in average transaction size along with increased transaction frequency suggests that UPI has become a part of everyday financial activities rather than being used only for large-value transfers. Further, the strong positive relationship between UPI adoption and merchant participation highlights that businesses are increasingly integrating digital payments into their operations. The divergence between rising UPI usage and stagnant ATM usage also confirms the gradual movement toward a cash-lite economy. Additionally, the findings suggest that UPI contributes to achieving Sustainable Development Goals by improving financial inclusion, supporting small businesses and strengthening digital infrastructure. Overall, UPI has emerged as not only a payment tool but also a catalyst for behavioural change and inclusive economic growth in India.

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