


INDIA'S DIGITAL ECONOMY: INNOVATIONS, CHALLENGES AND REGULATORY EVOLUTION

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Abstract

The primary objective of the study is to study India's evolving Digital Public Infrastructure. It will highlight the importance of Unified Payments Interface, Unified Lending Interface and Central Bank Digital Currency along with recent advancements, the successful integration of RuPay and FASTag. This paper also examines the robust governance mechanisms implemented by Reserve Bank of India, including the Payment Regulatory Board and mandatory two-factor authorization. Continuous vigilance is required against growing cyber security threats and an urgent need to close the significant digital literacy gap threatening consumer trust. The key focus is the system's potential to accelerate national economic growth, along with the financial inclusion of marginalized populations. The study focuses on strategies for India to successfully manage its "digital-first" economy by addressing the complexities of scale and security.

Keywords

Digital Economy, UPI, ULI, CBDC

Introduction: India's Digital Public Infrastructure (DPI)

The Indian FinTech sector has undergone a major transformation as the country rapidly moves toward a digital-first economy. Key initiatives like the Unified Payments Interface (UPI) have revolutionized how people transfer money instantly and securely. The emerging Unified Lending Interface (ULI) aims to simplify and speed up credit access through digital platforms. The digital currency issued by Reserve Bank of India, the Central Bank Digital Currency (CBDC) issued is also a new initiative in this direction. Together, these systems form a strong Digital Public Infrastructure (DPI) that promotes transparency, interoperability and financial inclusion. India's model is now being recognized globally for its scale and innovation. This paper explores the latest

developments, challenges and regulatory measures shaping India's digital payment ecosystem as of late 2025.

Recent Advancements in Core Payment Systems

The digital payment strategy of India focused on simultaneous innovations in the areas of credit, payments and currency systems to create a robust financial ecosystem. The speed, transparency and accessibility of financial transactions are ensured by the integration of UPI, ULI and CBDC. These advancements together strengthen India's position as a global leader in digital finance.

Unified Payments Interface (UPI)

UPI remains India's biggest success story and is now the world's largest real-time payment system by volume. In August 2025, UPI crossed 20 billion

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transactions in a single month, with a total value of over ₹24.85 lakh crore, making up more than 85% of all digital transactions in India by June 2025 (PBI, 2025). The transaction limit for Person-to-Merchant (P2M) payments in selected verified categories has been increased to ₹10 lakh per day, supporting high-value digital commerce. The UPI is being studied by the International Monetary Fund (IMF) as a model for other nations and it is also gaining importance within the BRICS group. The services of UPI is available in countries like France, United Arab Emirates (UAE), Singapore, Bhutan, Nepal, Sri Lanka and Mauritius. Additionally, the integration of RuPay credit cards with UPI has enabled credit-linked payments, increasing its use cases and average transaction values.

Central Bank Digital Currency (CBDC) - Digital Rupee (₹)

The Reserve Bank of India (RBI) is carefully expanding the Central Bank Digital Currency (CBDC) pilot to build trust and ensure ease of use. By March 2025, the retail e-Rupee pilot grew to over 6 million users and 17 banks, with the total value of e-Rupee in circulation increasing by 334% year-over-year (Giottus, 2025). New features such as offline functionality have been added so that the digital rupee can be used even in areas with poor or no internet access. The CBDC now also supports programmability, allowing conditional and purpose-specific transfers that make Direct Benefit Transfers (DBT) more effective and secure. Moreover, the RBI has demonstrated interoperability between the CBDC and UPI, allowing both systems to work smoothly together for payment settlements.

Unified Lending Interface (ULI)

The Unified Lending Interface (ULI) is emerging as the next major digital platform aimed at making credit access more inclusive. It is a technology framework built to bring openness and interoperability to credit markets. ULI allows the secure and consent-based sharing of digital information—such as land records and other data—from different service providers to

lenders. This helps reduce the time needed for credit appraisal, especially benefiting small borrowers and micro-entrepreneurs. Although it is sometimes referred to as the Unified Ledger Interface for connecting various payment systems on a single ledger. Its main goal is to transform the lending process, making borrowing easier, more transparent and accessible to all.

The Wider Digital Ecosystem: RuPay and FASTag

India's wider digital ecosystem is strengthened by homegrown innovations like RuPay and FASTag, both managed by the National Payments Corporation of India (NPCI). These systems play a vital role in promoting financial inclusion and driving the country's digital transformation.

RuPay is India's own domestic card payment network and an important tool for expanding banking access. It serves as the main card under the Pradhan Mantri Jan Dhan Yojana (PMJDY), helping bring unbanked citizens into the formal financial system (NPCI, 2025). The integration of RuPay credit cards with UPI has been a major milestone, allowing users to make credit-based payments through UPI's vast merchant network and thereby, increasing the use of credit cards across the country.

FASTag is an example of how digital adoption has been successfully implemented in the transport sector. Using the National Electronic Toll Collection (NETC) system, it enables 100% digital toll payments, reducing waiting times, saving fuel and improving overall logistics efficiency. It stands as a clear success story in digitizing a high-volume and everyday transaction segment across India's highways.

Economic Impact and Financial Inclusion

UPI, ULI and CBDC are acting as powerful catalysts for national economic growth and the financial inclusion of marginalized people.

Table 1: Benefits for Marginalized Groups and Economic Growth

Payment System	Primary Benefits for Marginalized Groups	Support for Economic Growth
UPI	Enables universal, low-cost access, empowering small vendors and micro-entrepreneurs to accept digital payments.	Creates a digital trail that curbs tax evasion and corruption, leading to an increased tax base.
ULI	Bridging the credit gap by providing data-driven, formal credit to the new-to-credit segments (MSMEs, rural borrowers) who lack traditional collateral.	Eliminates friction and delays in the lending process, increasing business productivity and capital access.
CBDC (e₹)	Features like Programmable CBDC (p-CBDC) ensure Government grants and targeted subsidies are used only for their intended purpose, drastically reducing fraud and leakage.	Reduces the high cost associated with printing, storing and transporting physical currency, enhancing system efficiency.

Source: Compiled by Author

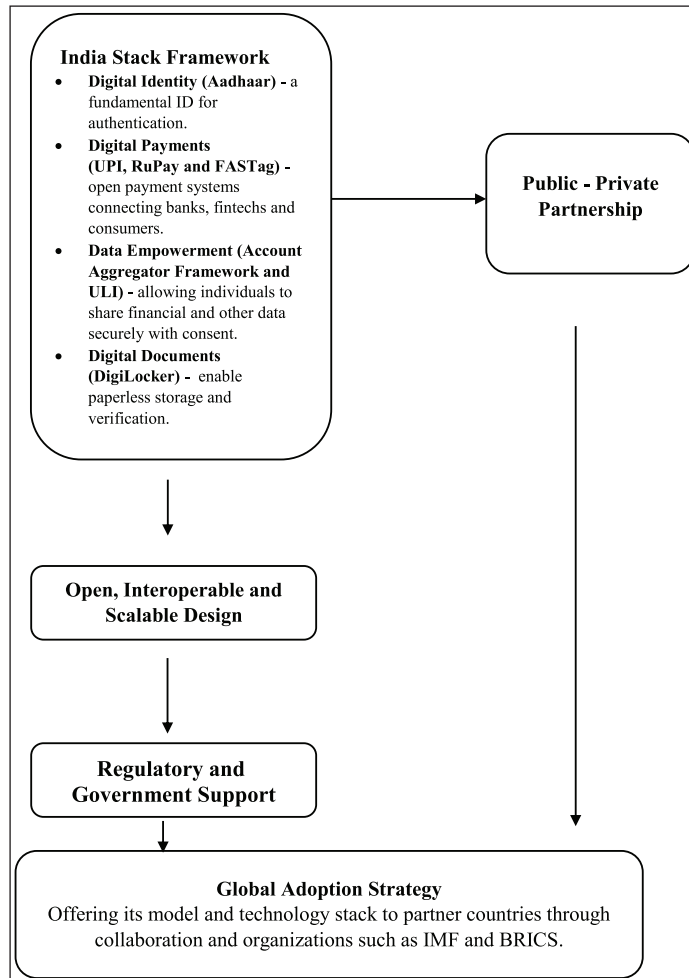
Global Ambitions and International Expansion

The Government of India promoted DPI with an intention to strengthen country’s global presence and economic stability. The international expansion of systems like UPI and the digital rupee reflects India’s ambition to become a leader in digital innovation. The global use of UPI is helping to make international money transfers faster and cheaper. This is especially important for India, which is the world’s largest recipient of remittances, as it helps boost foreign exchange reserves and supports families receiving money from abroad. In addition, the Reserve Bank of India is conducting cross-border CBDC trials with countries such as the UAE and Singapore. These efforts simplified international payments, reduced the number of intermediaries and decreased transaction costs. The growing success of UPI and other DPI components also enhances nations soft power, positioning the country as a global example in building inclusive and efficient digital systems.

The Architecture of India’s Digital Economy

The DPI in India is built on the “India Stack” model that brings together a set of digital platforms. Its components include Aadhaar for digital identity, RuPay and FASTag for payments, the Account Aggregator Framework and ULI for secure data sharing and DigiLocker for storing and verifying documents digitally. This system is designed with an open and scalable structure that allow banks, FinTechs and other countries to connect easily using standards. The Government builds the main digital framework, while the private companies creating apps and services on top of it. This process reduces costs and encourages innovation. The RBI and NPCI oversee standards, security and interoperability that maintain trust of the system. The DPI diplomacy of India, partnering with countries like UAE, Singapore and Mauritius and working with IMF and BRICS, helps other nations to adopt similar systems.

Figure 1: Architecture of India's Digital Economy



Source: Author's own work

Critical Challenges and Mitigation Initiatives

The rapid scaling of digital payments is accompanied by critical challenges related to security and inclusion.

Cyber security and Fraud

According to a report presented in the Lok Sabha in February 2025, the number of fintech cyber fraud cases reached 1.13 million in 2023, resulting in losses ₹ 7,488.6 crore (Business Standard, 2024). The fintech ecosystem now faces new and complex threats, including synthetic identity fraud and advanced AI-powered cyber-attacks. To address new risks, the

RBI has updated its Master Direction to include offline payment aggregators under the same regulations as online aggregators. For better consumer protection, measures like zero customer liability in specific fraud cases and faster grievance redressal systems have been introduced to build confidence and ensure user safety in digital transactions.

While QR code payments offer a seamless and cost-effective digital transaction mode, they present significant challenges due to their “black box” nature. Users cannot verify a link's destination until they scan the code. Fraudsters create a primary security

hurdle called QR-phishing by embedding malicious links in emails or posters to harvest sensitive banking credentials. In public spaces, criminals often employ overlay fraud, where they paste counterfeit stickers over legitimate merchant codes to redirect payments into their own accounts. Additionally, scammers frequently exploit social engineering; they convince victims that they must scan a code to receive money, using this common myth to authorize unauthorized debits from the victim's account. To mitigate these risks, experts encourage users to use in-app scanners that provide URL previews and to treat any signs of physical tampering on a QR stand as a major red flag.

Digital Literacy and Inclusion

The success of India's digital system depends on how quickly we improve the digital literacy. Government programs like the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) play a major role in promoting digital awareness and training people in rural areas. To make digital tools more inclusive, it is essential to provide payment apps and CBDC wallets in all major Indian languages so that language does not become a barrier. At the same time, projects like BharatNet are working to bring broadband internet to every Gram Panchayat, ensuring that people across the country have reliable access to the digital world.

Legal and Regulatory Framework Updates

The Reserve Bank of India (RBI) has strengthened its legal and regulatory framework to balance digital innovation with strong consumer protection. A major step in this direction is the creation of the Payments Regulatory Board (PRB), a six-member body chaired by the Governor, RBI and including Government representatives. The Payment Regulatory Board is responsible for improving security, preventing fraud and ensuring transparency in all digital transactions. The PRAVAAH Portal (Platform for Regulatory Application, Validation and Authorization) portal became mandatory from May 1, 2025. It serves as a single-window online system for all regulated entities to submit applications for licenses and

approvals, ensuring efficiency, processing speed and transparency.

In 2025, the RBI introduced new Security and Authentication Directions requiring at least two distinct factors of authentication for all digital payment transactions, with one being dynamic for non-card-present payments. Additionally, all entities must fully comply with the Digital Personal Data Protection Act, 2023, to safeguard users' personal and financial data. Further, the RBI issued updated regulations for Digital Lending and Payment Aggregators. The Digital Lending Directions mandate that loans will be directly credited to borrowers' bank accounts (not through lending service providers) and that all customer data be stored only on servers located in India (RBI, 2025). The Payment Aggregator Regulation introduced uniform rules for both online and offline aggregators, ensuring stricter merchant verification, stronger fund protection and better overall transparency in the digital finance ecosystem (Mondaq, 2025).

Conclusion and Recommendations

India's digital payment system, led by UPI, ULI and the CBDC, has become strong, innovative and fast-evolving. The Government and the Reserve Bank of India (RBI) are working together to manage this large-scale growth while ensuring proper regulation and consumer protection. A key priority is cyber security, which requires constant investment in research and development to fight Artificial Intelligence (AI)-driven cyber threats. Specific focus must be placed on mitigating "black box" risks like QR-phishing and overlay fraud, ensuring that technical convenience does not come at the cost of user security. It is equally important to have quick and effective systems for handling user complaints to maintain public trust in digital payments. Another recommendation is to create a sustainable UPI revenue model. This means developing fair incentives for banks and Payment Service Providers (PSPs), moving beyond the current zero-Merchant Discount Rate (MDR) model, so that the system remains financially viable in the long-term. Lastly, expanding digital literacy is crucial. Public

awareness campaigns should be organized against the common myths, such as the misconception that scanning a QR code is required to receive funds, to protect vulnerable users from social engineering. Campaigns in all major Indian languages, especially for people in rural areas and older citizens, will help close the digital divide and promote true financial inclusion. With these efforts, India's integrated digital public infrastructure is well-placed to deepen financial inclusion, remove long-standing barriers and strengthen the nation's position as a global leader in the digital economy.

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