

EVOLUTION OF THE DIGITAL PAYMENT SYSTEM IN INDIA: INSTITUTIONAL FOUNDATIONS, POLICY INTERVENTIONS, AND A PESTLE PERSPECTIVE

Ankita Pandey

Academic Associate, Indian Institute of Management, Lucknow

Dr. Himanshu Mohan

Associate Professor, Department of Business Administration, University of Lucknow

Abstract

India's shift towards digital payments was a gradual process, not solely triggered by demonetization or UPI's emergence. The period between 2012 and 2016 was crucial, characterized by regulatory strengthening, institutional development, and an incremental expansion of digital and financial infrastructure. This paper investigates how instruments like NEFT, RTGS, cards, IMPS, and prepaid payment methods evolved in India's cash-dominant economy during these years, utilizing data from the Reserve Bank of India, government reports, and academic research. A PESTLE analysis further identifies the political, economic, social, technological, legal, and environmental influences. The study concludes that this timeframe established vital foundations in regulation, financial inclusion, and technological readiness, even though digital payments complemented rather than replaced cash. Demonetization in late 2016 is seen as a catalyst that demonstrated existing institutional readiness, rather than a sign of immediate behavioral change, thus marking 2012-2016 as a significant phase of institutional development in India's digital payment evolution.

Key words: *Digital payments, cash economy, financial inclusion, payment systems, PESTLE analysis, India*

I. INTRODUCTION

Payment systems constitute the foundation of contemporary economies, facilitating the efficient and trustworthy exchange of goods, services, and financial value with efficacy and reliability. In emerging economies like India, where cash has historically prevailed in transactions, the shift to digital payments is neither straightforward nor solely driven by technology. It is influenced by a confluence of institutional reforms, policy initiatives, societal preparedness, and economic framework. Although contemporary scholarship predominantly emphasizes post-2016 developments, namely demonetization and the proliferation of UPI, there is very scant academic focus on the preceding period that established the groundwork for these transformations. The years between 2012 and 2016 reflect a changeover moment in India's payment ecosystem.

During this period, digital payments existed alongside currency but did not significantly displace it. India maintained a mainly cash based economy, with money in circulation accounting for roughly 18 percent of gross domestic product (GDP), a ratio much higher than that recorded in sophisticated economies. Despite the availability of electronic payment tools, consumer and merchant behaviour continued to choose cash for most retail transactions.

Understanding this period is important for two reasons. First, it helps explain why certain policy interventions succeeded or failed in accelerating digital payments later. Second, it highlights the role of institutional preparedness and contextual factors in shaping technology adoption. This paper therefore seeks to analyse the evolution of India's digital payment system during 2012–2016, focusing on institutional developments, policy initiatives, and structural constraints, and employing a PESTLE framework to provide a holistic analysis.

II. LITERATURE REVIEW

The evolution of digital payment systems has been widely examined in the context of financial inclusion, transaction efficiency, and economic formalization. Early studies on payment systems emphasise the role of institutional trust and regulatory oversight in encouraging non-cash transactions, particularly in economies with a strong preference for cash. In the Indian context, scholars have consistently highlighted that digital payment adoption is shaped not only by technological availability but also by socio-economic structure, financial literacy, and policy design.

Research on cash usage in India underscores the depth of cash dependence prior to 2016. Mazzotta et al. (2014) document that India's high cash intensity is rooted in informality, limited merchant digitization, and strong cultural preferences for liquidity. Their analysis of the economic cost of cash provides an important rationale for digital payment promotion, while also cautioning that cost efficiency alone may not be sufficient to induce behavioural change.

Studies on financial inclusion further explain uneven adoption patterns. Gupte et al. (2012) develop a financial inclusion index for Indian states and show that access to banking services varies significantly across regions. This unevenness directly affects the ability of households to engage with digital payment services. Dixit and Ghosh (2013) believe that financial inclusion measures may boost inclusive growth only when access is supported by usage and knowledge, a criterion that remained partially satisfied during the early 2010s.

From a technological adoption viewpoint, Ingle and Pardeshi (2012) identified trust, security concerns, and insufficient digital literacy as important impediments to internet banking and electronic payments in India. Their findings imply that technological dissemination is controlled by perception and confidence rather than infrastructure alone.

Similarly, Pheeraphuttharangkoon and Choudrie (2012) underline the need of contextual design and user-centric communication in the adoption of digital technologies, highlighting that solutions must correspond with local capabilities and expectations.

More recent institutional evaluations highlight that India's payment system changes took a staged approach, beginning with bank-led electronic transfers and progressively progressing towards interoperable platforms. This literature implies that the period prior to 2016 should be

considered as a preparatory stage, during which regulatory clarity, institutional coordination, and infrastructural growth provided the circumstances for subsequent acceleration.

Building on these observations, the present study focuses on the 2012–2016 era to understand how core pieces of India's digital payment ecosystem were formed.

III. METHODOLOGY AND DATA SOURCES

The study utilizes a descriptive and analytical research design based on secondary data. Data have been taken mostly from official publications of the Reserve Bank of India, including Annual Reports and Payment System Indicators, which provide instrument-wise statistics on transaction volumes and values. These sources are reinforced by government policy documents, working papers, and peer-reviewed academic research concentrating on digital payments, financial inclusion, and technology uptake in India.

To give a methodical and comprehensive study, the paper adopts the PESTLE methodology. This approach permits the comprehensive evaluation of political, economic, social, technological, legal, and environmental aspects driving digital payment development. The PESTLE technique is particularly relevant for the Indian setting, as payment system evolution is affected by many external variables beyond technology alone.

IV. EVOLUTION OF DIGITAL PAYMENTS IN INDIA

During the period under review, India's digital payment environment was predominantly bank centric. Electronic funds transfer services such as NEFT and RTGS constituted the heart of non cash transactions. NEFT showed consistent increase in both volume and value, reflecting its expanding use for retail transfers, while RTGS continued to cater primarily to high value corporate and inter bank transactions.

Card based payments surged in terms of issuance, notably debit cards following the advent of large scale financial inclusion efforts. However, use trends suggest that debit cards were largely utilized for ATM withdrawals rather than point of sale purchases.. In 2015, only a small number of debit card transactions happened at PoS terminals, whereas the majority included cash withdrawals, reinforcing the complementing rather than substitutive role of digital instruments. The introduction and gradual expansion of Immediate Payment Service (IMPS) marked an important technological step by enabling real-time, 24x7 transfers. However, adoption remained limited to urban and digitally aware users. Prepaid payment instruments and digital wallets emerged during this period, largely as closed-loop systems driven by convenience and promotional incentives. Their reach was limited, and sustained usage remained uncertain.

The launch of UPI in April 2016 represented a major institutional innovation, but its impact lies largely outside the scope of this study due to negligible transaction volumes during the initial months. Thus, the period 2012–2016 can be characterised as one of gradual experimentation and infrastructure building rather than widespread digital payment adoption.

V. CASH DOMINANCE AND ECONOMIC COST OF CASH

India's reliance on cash during this period was substantial. Studies estimate that nearly 87 percent of the total value of transactions in 2012 was conducted in cash. Currency in circulation as a proportion of GDP remained close to 18 percent, significantly higher than international benchmarks. This high dependence on cash was associated with considerable economic costs. The total annual cost of currency operations in India, including printing, transportation, storage, and security, was estimated at around ₹210 billion. These costs represent an efficiency loss to the economy and provided a strong economic rationale for encouraging digital payment alternatives. However, the persistence of cash usage reflects deep-rooted behavioural preferences, informality, and trust in physical currency.

VI. PESTLE ANALYSIS OF DIGITAL PAYMENT DEVELOPMENT IN INDIA

6.1 Political and Policy Factors

Political commitment and public policy interventions were central to shaping the trajectory of digital payments in India during 2012–2016. Regulatory oversight by the Reserve Bank of India (RBI) provided institutional stability and clarity through periodic circulars, operating guidelines, and supervisory mechanisms. This consistency was crucial in building confidence among banks and payment service providers, even though end-user adoption remained limited during this phase.

Government-led initiatives further reinforced the policy environment. The Digital India programme sought to expand digital infrastructure, improve broadband connectivity, and promote technology-enabled service delivery across sectors. While its immediate effect on retail digital payments was modest, the initiative strengthened the ecosystem necessary for long-term digital adoption.

Another significant policy intervention was the expansion of Direct Benefit Transfer (DBT) schemes. By transferring subsidies and welfare benefits directly into beneficiaries' bank accounts, DBT reduced leakages, enhanced transparency, and improved targeting efficiency (Gupte et al., 2012; Dixit & Ghosh, 2013). Although DBT primarily facilitated government-to-person transactions rather than consumer payments, it familiarised millions of households with formal banking channels and electronic fund transfers, thereby indirectly supporting digital payment readiness.

6.2 Economic Factors

Economic conditions played a decisive role in limiting the rapid diffusion of digital payments during the study period. India's economy was characterised by a high degree of informality, a large share of small-value transactions, and widespread dependence on daily cash flows. These structural features reduced the relative attractiveness of digital payments for both consumers and merchants.

While electronic payment systems such as NEFT, RTGS, and IMPS improved transaction efficiency and reduced settlement times, their impact was largely confined to banks, corporates, and urban users. For small merchants, concerns related to transaction costs, tax visibility, and

infrastructure investment constrained adoption. As a result, digital payments functioned primarily as efficiency-enhancing complements to cash rather than substitutes.

6.3 Social Factors

Social and demographic factors significantly influenced digital payment adoption outcomes. Financial inclusion studies consistently highlight disparities in access to banking services across regions, income groups, and occupations (Gupte et al., 2012). Rural households, informal workers, and low-income populations faced greater barriers to participating in the digital economy.

Low levels of digital and financial literacy further constrained adoption. Many users perceived electronic payments as complex or risky, with concerns related to transaction failure, fraud, and lack of grievance redressal mechanisms (Ingle & Pardeshi, 2012). Continued reliance on cash in these communities' exacerbated challenges related to personal security, record-keeping, and financial management. These findings underscore that social readiness and trust are as important as technological availability in shaping payment behaviour.

6.4 Technological Factors

Technological developments during the period have focused on building foundational payment infrastructure rather than achieving mass adoption. The expansion of IMPS enabled real-time, 24x7 transfers, while the introduction of RuPay cards improved domestic card network penetration. Aadhaar-linked payment mechanisms also emerged during this period, enhancing interoperability and identity verification.

However, adoption remained constrained by usability challenges, limited smartphone penetration, and uneven internet connectivity, particularly in rural and semi-urban areas. Prior research emphasises that digital payment technologies must be designed with an understanding of local contexts and communicated effectively to potential users to encourage adoption (Pheeraphuttharangkoon & Choudrie, 2012). The limited diffusion observed during this period reflects the gap between technological capability and user readiness.

6.5 Legal and Environmental Factors

The legal framework governing payment systems in India was anchored by the Payment and Settlement Systems Act, 2007, which empowered the RBI to regulate and supervise payment system operators. This framework ensured operational stability, consumer protection, and systemic resilience during the gradual expansion of digital payment instruments.

Environmental considerations were not a primary driver of digital payment policy during the study period. Nevertheless, reduced reliance on physical currency implied potential long-term environmental benefits through lower paper usage, reduced transportation and storage requirements, and decreased energy consumption associated with cash handling. These benefits, while indirect, add to the broader case for digital payment adoption in the long run.

Table 1. PESTLE Analysis of Digital Payment System Development in India

Dimension	Key Factors	Implications for Digital Payments	Key Sources
Political	Government push for digitization; welfare delivery reforms	Policy support through Digital India and DBT schemes strengthened institutional readiness but did not immediately alter retail payment behaviour	Dixit & Ghosh (2013); RBI (2013–2016)
Economic	High cash dependence; cost of cash	Cash dominated retail transactions; high currency handling costs (₹210 billion annually) provided economic rationale for digital payments, but micro-level incentives remained weak	Mazzotta et al. (2014); RBI (2016)
Social	Financial inclusion gaps; low digital literacy; trust deficit	Uneven access to banking and low awareness limited adoption among rural and low-income groups; cash remained preferred for daily transactions	Gupte et al. (2012); Ingle & Pardeshi (2012)
Technological	IMPS, RuPay, Aadhaar-linked systems; limited connectivity	Foundational infrastructure improved interoperability, but low smartphone penetration and usability issues constrained diffusion	Pheeraphuttharangkoon & Choudrie (2012); RBI (2015–2016)
Legal	Payment and Settlement Systems Act, 2007	Provided regulatory clarity, consumer protection, and systemic stability, enabling gradual expansion of digital payment instruments	RBI (2013–2016)
Environmental	Reduced reliance on physical currency (indirect)	Potential long-term reduction in paper usage, transport, and energy costs, though not a primary policy driver during this phase	Mazzotta et al. (2014)

Source: Compiled by the authors based on RBI Annual Reports, peer-reviewed literature, and policy studies.

VII. DEMONETIZATION AS AN END-PERIOD SHOCK

The demonetization of high-value currency notes in November 2016 withdrew approximately 86 percent of currency value from circulation. Within the analytical scope of this study, demonetization is best interpreted as an exogenous shock occurring at the end of the period, forcing a temporary shift towards non-cash transactions. While digital transaction volumes increased immediately after demonetization, it is inappropriate to infer permanent behavioural change within the studied timeframe alone.

VIII. DISCUSSION AND POLICY IMPLICATIONS

The findings of this study highlight that India's digital payment evolution during last five years was gradual, institution-led, and highly context-specific. Contrary to narratives that frame digital payment growth as a rapid technological disruption, the evidence suggests that progress during this period was incremental and constrained by structural realities such as informality, low digital literacy, and entrenched cash preferences.

From a policy perspective, the analysis underscores the importance of sequencing reforms. Regulatory stability and institutional coordination, as demonstrated by RBI oversight and the consolidation of payment systems, were critical in building trust. Financial inclusion initiatives expanded access to banking, but limited emphasis on usage and digital awareness reduced their immediate impact on retail digital payments.

The PESTLE analysis further reveals that social and behavioural factors played as important a role as technological availability. Policies that focus solely on infrastructure expansion without addressing trust, literacy, and user experience are unlikely to achieve sustained adoption. The demonetization episode illustrates this point clearly: while it temporarily increased digital transaction volumes, long-term behavioural change depended on pre-existing institutional and social readiness.

These insights suggest that future digital payment strategies should adopt a balanced approach that integrates regulatory support, economic incentives, user-centric design, and targeted digital literacy initiatives. Such an approach is essential not only for increasing transaction volumes but also for ensuring inclusive and sustainable digital payment adoption.

IX. CONCLUSION

This paper examined the evolution of India's digital payment system during the period 2012-2016, a phase that played a crucial role in shaping subsequent developments. The analysis shows that despite the availability of electronic payment instruments, India remained a predominantly cash-based economy during this period. Digital payments functioned largely as complements to cash rather than substitutes, reflecting deep-rooted behavioural preferences and structural constraints.

The study demonstrates that significant groundwork was laid through regulatory consolidation, financial inclusion initiatives, and technological experimentation. The application of the PESTLE framework highlights how political commitment, economic efficiency considerations, social disparities, technological readiness, and legal frameworks jointly influenced outcomes. Demonetization, occurring at the end of the study period, is best understood as a catalyst that exposed both strengths and weaknesses in the digital payment ecosystem.

By positioning the period of study as a preparatory and institution-building phase, this paper contributes to a more nuanced understanding of India's digital payment journey. Recognising the importance of this phase is essential for policymakers and researchers seeking to design effective and inclusive digital payment strategies in the future.

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