Digital Transformation in Indian Banking Sector: The Evolution of E-Banking.

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Abstract

The advancement of information and communication technology (ICT) has significantly transformed banking services from traditional branch-based operations to digital and real-time platforms. This study examines the evolution of e-banking in India and analyses the growth trends of major electronic payment systems to understand the structural transformation of the banking sector. The study is based on secondary data collected from the Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), and other official sources for the period 2016–17 to 2023–24. The development of e-banking is reviewed across four phases—Genesis, Growth, Development, and Maturity. A comparative analysis of transaction volumes and values of Unified Payments Interface (UPI), National Electronic Funds Transfer (NEFT), and Real-Time Gross Settlement (RTGS) is conducted to identify emerging trends. The findings indicate that UPI has grown exponentially and has become the dominant platform for retail digital payments, while NEFT and RTGS continue to serve medium- and high-value transactions. The results reflect a clear shift toward high-frequency, low-value, real-time transactions. The study concludes that India has emerged as a global leader in digital payments, with strong policy support and technological infrastructure driving the rapid expansion of e-banking.

Keywords: E-Banking, Digital Payments, Unified Payments Interface (UPI), NEFT and RTGS, Financial Technology (FinTech). Digital Banking Transformation, and Indian Banking Sector.

1. Introduction

The concept of e-banking has redefined the nature of banking services globally. Traditionally, banking was branch-based, paper-heavy, and transaction-oriented. With the advent of information and communication technology (ICT), banking transformed into a service that could be accessed beyond the physical walls of banks. In the developed economies of the West, electronic banking began with Automated Teller Machines (ATMs) in the 1970s and later expanded into internet banking in the 1990s (Singh & Malhotra, 2019). India's e-banking journey, although delayed compared to advanced economies, became far more rapid and inclusive once it gathered pace. India has not only adopted e-banking practices but has emerged as a global leader in digital transactions. According to ACI Worldwide (2023), India accounted for nearly 46% of global real-time payment transactions in 2022, more than the combined share of the United States, China, and Europe. Tracing the genesis and growth of e-banking is essential for two reasons. First, it provides historical clarity about the institutional and technological milestones that shaped digital banking. Second, it offers empirical evidence of transformation, which is critical for evaluating customer perceptions and satisfaction in subsequent objectives. This section therefore reconstructs the journey of Indian e-banking in four phases: Genesis (1987–1999), Growth (2000–2010), Development (2011–2020), and Maturity & Consolidation (2021–2024).
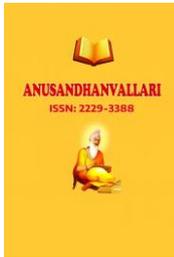
1.2 Genesis of E-Banking in India

The genesis of e-banking in India began in 1987, when the Hongkong and Shanghai Banking Corporation (HSBC) installed the first ATM in Mumbai (Rao, 2008). This was the first step in automating customer services outside bank premises. The early 1990s witnessed the arrival of private sector banks such as ICICI and HDFC, which introduced internet banking portals. However, their services were limited to account balance checks, intra-bank fund transfers, and requests for cheque-books. A notable development during this period was the launch of the Swadhan shared ATM network in 1997 by the Indian Banks' Association. It included more than 1,000 ATMs owned by over 50 banks and represented India's first attempt at interoperability (RBI, 2001). Although Swadhan was later discontinued due to high operational costs, it demonstrated the feasibility of shared digital infrastructure.

At the same time, debit and credit cards were gradually introduced. Yet, low internet penetration, lack of awareness, and cyber-security concerns restricted e-banking adoption to urban elites. This phase can be described as experimental, laying the groundwork for the digital transformation to follow.

- **Growth Phase**
  The new millennium marked a significant leap. In 2001, the Reserve Bank of India (RBI) issued the Guidelines on Internet Banking, making it mandatory for banks to adopt security protocols and board approvals before offering digital services (RBI, 2001). This step provided the much-needed legitimacy and structure for online banking.

This decade saw three major innovations:

1. Real-Time Gross Settlement (RTGS), 2004: Designed for high-value, real-time interbank transfers. By 2008, RTGS had become the standard for corporate settlements (RBI, 2004).

2. National Electronic Funds Transfer (NEFT), 2005: Enabled retail and small-value transactions nationwide, democratizing electronic fund transfers (RBI, 2005).

3. Mobile Banking Guidelines, 2008: Allowed banking through SMS and mobile apps, paving the way for banking-on-the-go (RBI, 2008).

By 2010, most scheduled commercial banks had internet portals. ATMs had proliferated, debit/credit card usage was expanding, and NEFT/RTGS transactions had increased manifold. This phase marked the transition from experimental adoption to mainstream integration.

- **Development Phase**
  The decade after 2010 was transformative, largely due to government initiatives, financial inclusion drives, and digital innovations. In 2014, the Pradhan Mantri Jan Dhan Yojana (PMJDY) led to the opening of over 400 million new accounts, many Aadhaar-linked and mobile-enabled (Government of India, 2015). In 2015, the Digital India campaign expanded internet penetration and digital literacy.

The demonetization of high-value currency notes in November 2016 created unprecedented urgency for cashless payments (Chauhan, 2017). The same year, the National Payments Corporation of India (NPCI) launched the Unified Payments Interface (UPI). UPI was revolutionary because it was real-time, mobile-first, interoperable, and free of the constraints of banking hours. Unlike NEFT and RTGS, which had limited time windows and processes, UPI allowed instant fund transfers between any two bank accounts using just a smartphone.

By 2018–19, UPI volumes had already crossed 374 crore transactions annually, worth around ₹9 lakh crore. By 2019–20, the figure was 1,252 crore transactions valued at ₹21.3 lakh crore. This exponential growth demonstrated UPI's role as the backbone of India's digital payments ecosystem.
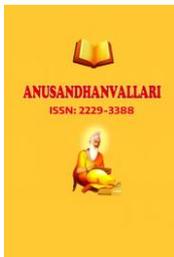
- **Maturity and Consolidation Phase**

  After 2020, India entered the maturity phase of e-banking. The COVID-19 pandemic accelerated the use of digital payments due to the need for contactless transactions. By 2021–22, UPI volumes had reached 4,600 crore, worth ₹84 lakh crore. By 2022–23, the figure had doubled to 8,375 crore transactions worth ₹139 lakh crore (NPCI, 2023). By FY 2023–24, UPI reached 13,116 crore transactions valued at nearly ₹200 lakh crore, making it the undisputed leader of India's retail payments (Ministry of Finance, 2023). Even rural areas witnessed UPI penetration, with roadside vendors, farmers, and small shopkeepers using QR codes for payments.

  Meanwhile, NEFT volumes grew from 1,626 crore in 2016–17 to 4,100 crores in 2023–24, while RTGS volumes grew from 120 crore to 230 crore in the same period. Although steady, these systems were overshadowed by UPI's exponential surge.

2. Literature Review

During the mid-1990s, the emphasis on technology adoption became clearer. Oliver's (1997) Satisfaction: A Behavioral Perspective on the Consumer was a landmark contribution, explaining how expectancy–disconfirmation shapes satisfaction across industries, including financial services. This theoretical lens proved especially valuable as banks introduced electronic delivery channels. Daniel (1999), examining e-banking in the UK and Ireland, reported that although online platforms were still in their infancy, customers' perceptions of convenience and time-saving potential significantly influenced early adoption, while dissatisfaction was linked to security and trust concerns. This era is often described as the adoption phase of e-banking, during which the foundations laid in the 1980s and early 1990s were applied to real-world banking innovations. Humphrey (1996) demonstrated how payment systems improved operational efficiency in international markets, emphasizing that speed and reliability were increasingly shaping customer satisfaction. Mols (1998) expanded this perspective by studying PC banking in Europe, revealing that perceptions of convenience and risk directly affected both adoption and satisfaction levels. By 2010, attention shifted towards customer experience. Kaur and Kiran (2010) found that satisfaction in internet banking was mediated by perceptions of security and service reliability. Similarly, Arora (2010) emphasized that convenience was undermined by fears of fraud, demonstrating the importance of perception-satisfaction linkages. PwC (2012) reported that global users expressed rising satisfaction with online banking platforms, especially where seamless navigation and responsive services were offered. The period between 2016 and 2020 marked a transformative phase in international e-banking studies, characterized by the rapid adoption of real-time payment systems, proliferation of mobile applications, and the strengthening of fintech ecosystems. During this time, customer perception and satisfaction research increasingly focused on technology integration, security frameworks, and user-centric innovations. Chauhan and Patel (2016) highlighted that real-time payment systems significantly improved satisfaction levels by reducing transaction delays. Similarly, Deloitte (2016) found that digital wallets and mobile-first banking services were perceived as convenient, though concerns regarding data privacy persisted. The period from 2016 to 2020 was transformative for Indian e-banking, driven by policy initiatives, demonetization, and the rapid growth of Unified Payments Interface (UPI). The demonetization policy in 2016 accelerated digital adoption by reducing dependence on cash, while the Digital India campaign promoted awareness and accessibility of online services (RBI, 2017). Customers' perceptions during this phase were strongly influenced by convenience and government endorsement, while satisfaction levels were shaped by transaction reliability, speed, and trust in digital systems. Chauhan and Patel (2017) reported that post-demonetization, customers increasingly perceived e-banking as a necessity rather than a choice, though dissatisfaction persisted due to frequent system downtime. EY (2017) found that Digital India initiatives improved perceptions of e-banking reliability, especially among urban populations. NPCI (2016) highlighted the launch of UPI as a game-changer, allowing instant fund transfers and interoperability, which significantly improved satisfaction levels. KPMG (2017) noted that satisfaction rose sharply in younger demographics, who valued

mobile-first services. Between 2018 and 2019, studies reflected rapid adoption of UPI and mobile wallets. Patel (2018) found that customers perceived mobile wallets as convenient, though satisfaction was reduced by fraud risks and transaction failures. Chauhan (2019) observed that UPI adoption improved perceptions of speed and security, while rural customers continued to face barriers due to limited infrastructure. EY (2021) added that trust in cybersecurity frameworks and efficient grievance redressal systems was central to enhancing customer satisfaction globally. Nguyen (2021) emphasized that responsiveness and empathy continued to play a critical role in digital service satisfaction, echoing classical service quality dimensions. By 2022, research emphasized the role of mobile-first ecosystems. Chauhan (2022) reported that customers in emerging economies expressed satisfaction with mobile banking primarily due to 24/7 availability and personalization features. EY (2022) confirmed that satisfaction was highest in banks that integrated fintech partnerships, offering seamless services across platforms. World Bank (2022) stressed that trust in regulation and privacy safeguards continued to be essential for sustaining satisfaction. In 2023, comparative studies became more prominent.

3. Analysis and Findings

3.1 Comparative Data and Trend Analysis

In this section, a comparative examination of the datasets is presented to highlight key similarities, differences, and emerging patterns. The analysis focuses on identifying trends over time, thereby providing deeper insights into the underlying dynamics and their implications for the study.

Table 1: Comparative Analysis of UPI, NEFT, and RTGS Transaction Volumes and Values in India from F.Y. 2016–17 to 2023–24.

| Financial Year	UPI Volume (crore)	UPI Value (₹ lakh crore)	NEFT Volume (crore)	NEFT Value (₹ lakh crore)	RTGS Volume (crore)	RTGS Value (₹ lakh crore)
2016–17	0.03	0.009	1626	1200	120	7000
2017–18	92	1	1884	1468	135	8500
2018–19	374	9	2298	1723	150	9500
2019–20	1252	21.3	2740	2292	170	11000
2020–21	2733	41	3051	2450	185	12500
2021–22	4600	84	3500	2850	200	14500
2022–23	8375	139	3900	3100	215	16000
2023–24	13116	200.0	4100	3900	230	17080

Sources: Reserve Bank of India (2016–2024) and National Payments Corporation of India (NPCI) publications.

The table 1 illustrates the scale of transformation in India's digital banking landscape. In 2016–17, UPI was a marginal player with just 0.03 crore transactions, while NEFT and RTGS dominated. By 2017–18, UPI volumes had jumped to 92 crores, proving its scalability. The turning point was 2019–20, when UPI crossed 1,252 crore transactions, overtaking NEFT in visibility. By 2022–23, UPI volumes reached 8,375 crores, and by 2023–24,

they stood at 13,116 crores. In value terms too, UPI's ₹200 lakh crore eclipsed NEFT's ₹3,900 lakh crore. NEFT's growth was steady but gradual, while RTGS retained its dominance in large-value transactions. The interpretation is clear: UPI has emerged as the backbone of retail digital payments, while NEFT and RTGS continue to serve specialized niches.

The trend graph in Figure 1 visually confirms the findings. UPI's growth curve is exponential, while NEFT and RTGS show relatively linear progress. This reflects a structural transformation in transaction behaviour from low-frequency, high-value transactions to high-frequency, low-value real-time transactions.

Figure 1: Comparative trends of UPI, NEFT, and RTGS Transaction Volumes and Values in India from F.Y. 2016–17 to 2023–24.
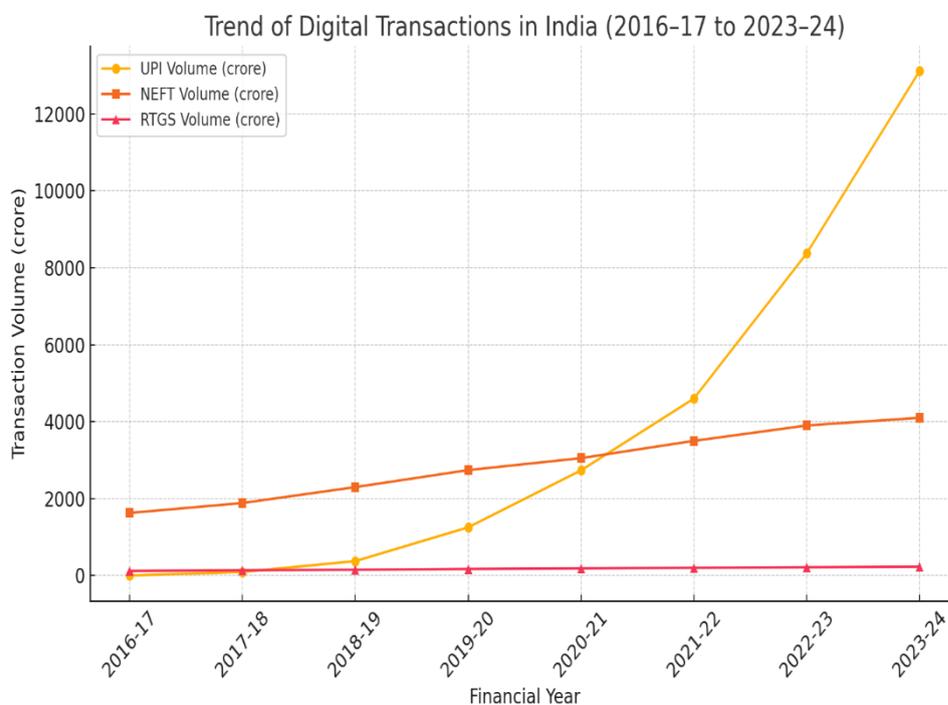

Source: Author's Computation based on RBI and NPCI data.

3.2 Findings

The analysis of transaction data and historical milestones clearly shows that UPI has become the backbone of India's digital payments ecosystem, growing from just 0.03 crore transactions in 2016–17 to more than 13,000 crores in 2023–24. This exponential rise highlights a major shift in consumer behaviour: from being cautious about digital channels in the early 2000s to fully embracing real-time, mobile-first banking by the 2020s. At the same time, NEFT and RTGS remain relevant but secondary. NEFT continues to serve as a trusted system for retail and medium-value transactions, while RTGS is still indispensable for high-value and corporate transfers. Their growth, however, has been steady rather than spectacular, and both have been overshadowed by the rapid surge of UPI.

The findings also emphasize the role of policy interventions such as PMJDY, Digital India, demonetization, and the push for contactless transactions during COVID-19. These initiatives created the right conditions for UPI's mass adoption, proving that technology alone is not enough without supportive governance. Perhaps the most
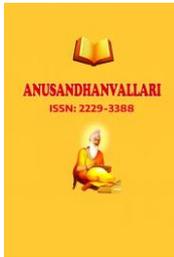
significant outcome is the democratization of digital banking. Unlike the early phases, where internet banking was limited to urban elites, UPI penetrated rural and semi-urban areas, making QR-code payments common even among street vendors and small farmers. This inclusivity, combined with convenience, has set new benchmarks for customer expectations.

Finally, the findings confirm India's global leadership in e-banking, as the country now processes nearly half of the world's real-time payment transactions. UPI has thus evolved from a domestic innovation into an international model that other countries are beginning to adopt.

4. Conclusion

The evolution of e-banking in India reflects a significant structural transformation in the delivery and usage of financial services. The study identified four distinct phases in this journey—Genesis (1987–1999), Growth (2000–2010), Development (2011–2020), and Maturity and Consolidation (2021–2024). From the installation of the first ATM to the widespread adoption of mobile-based real-time payment systems, the Indian banking sector has transitioned from limited technological experimentation to a fully integrated digital ecosystem. The empirical analysis of transaction data highlights a clear shift in the country's digital payment landscape. The Unified Payments Interface (UPI) has emerged as the dominant platform for retail transactions, recording exponential growth in both volume and value. In contrast, NEFT and RTGS have shown steady but moderate expansion and continue to serve specific segments such as medium-value retail and high-value corporate transactions. The overall trend indicates a behavioral transition from low-frequency, high-value transactions toward high-frequency, low-value, instant payment modes, reflecting changing customer preferences for convenience, speed, and accessibility. The findings also underscore the critical role of policy and institutional support in accelerating digital adoption. Initiatives such as financial inclusion programs, the Digital India mission, Aadhaar integration, demonetization, and the increased reliance on contactless payments during the COVID-19 period created an enabling environment for large-scale digital transformation. The rapid penetration of digital payment systems in semi-urban and rural areas further indicates the growing inclusiveness of India's e-banking ecosystem. The study concludes that India has reached a stage of maturity in digital banking and has established itself as a global leader in real-time payment systems. The success of UPI demonstrates the effectiveness of interoperable infrastructure, regulatory support, and public–private collaboration in driving large-scale financial innovation. However, the continued expansion of digital banking also necessitates sustained attention to issues such as cybersecurity, digital literacy, infrastructure reliability, and data privacy. Overall, the study provides a historical and empirical understanding of the evolution of e-banking in India and establishes a foundation for further research on customer adoption behaviour, service quality, satisfaction levels, and the emerging challenges in the digital banking environment.

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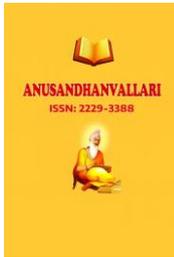
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