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Digital payment systems in India: Evolution, growth, trends and challenges for India's financial ecosystem

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Abstract
The digital payment landscape in India has experienced a significant transformation driven by technological advancements, government initiatives, and evolving consumer behaviour. This study offers a comprehensive analysis of the evolution and current state of digital payments in India from 2017-18 to 2024-25. During this period, transaction volume increased substantially by 15.2-fold, with a compound annual growth rate (CAGR) of 699%. The transaction value more than doubled with a CAGR of 1,371%. The Reserve Bank of India's Digital Payment Index rose consistently from 100 in 2017-18 to 493.22 in 2024-25. The key drivers of this growth include the adoption of the Unified Payments Interface (UPI), government initiatives such as Digital India and demonetization, the impact of the COVID-19 pandemic, and fintech innovations. Trends indicate faster volume growth compared to value, suggesting a shift towards smaller, more frequent transactions. Financial inclusion has been enhanced, particularly in rural areas, through mobile money and digital wallets. The study also highlights challenges, such as the digital divide, infrastructure limitations, trust and security concerns, and regulatory hurdles. Future prospects include the potential impact of Central Bank Digital Currency (CBDC) and the continued expansion of digital payment systems. This transformation in India's payment landscape has significant implications for financial inclusion, economic growth, and the broader fintech ecosystem.

Keywords: Digital payments, financial inclusion**,** unified payments interface (UPI)**,** fintech, central bank digital currency (CBDC)**,** digital transformation, financial ecosystem, etc.

1. Introduction
The digital payment landscape in India has experienced a profound transformation due to various technological advancements, increased smartphone penetration, and supportive government initiatives. The introduction of systems, such as the Unified Payment Interface (UPI), represents a significant advancement in payment systems, enabling real-time interbank transactions via mobile devices. UPI's modular architecture of the UPI facilitates ease of use, cost-effectiveness, and secure transactions, contributing to its widespread adoption and its potential to enhance financial inclusion in India (Gochhwal, 2017) [9]. India's FinTech revolution has been instrumental in this transformation, with digital and mobile payments gaining traction among diverse user segments, including those previously excluded from the financial networks. Prominent platforms, such as Paytm, Google Pay, and PhonePe, have played significant roles in this growth. The integration of financial literacy, trust, privacy, and service quality has been crucial in influencing user acceptance and actual usage of digital payment systems (Patnaik *et al*., 2023) [26]. Despite growth in digital payments, a concurrent increase in cash usage remains. Factors influencing consumer behaviour include trust in digital payment systems, experience with online fraud, and demographic factors such as age, gender, and income. Notably, past negative experiences with online fraud can deter the use of digital payments, although the effect varies by transaction type (Shree *et al*., 2021) [29]. Another dimension of this transformation is the role of financial technology (FinTech) in promoting financial inclusion, particularly in rural areas. Mobile money and digital wallets have bridged the gap between banked and unbanked populations, making financial transactions more affordable and reliable, while eliminating spatial barriers. This has positively influenced entrepreneurial activities in underdeveloped regions, marking a significant step toward digital financial inclusion (Goswami *et al*., 2022) [10]. The Reserve Bank of India's (RBI) consideration of Central Bank Digital Currency (CBDC) aims to boost

financial inclusion further by enhancing the efficiency and stability of the financial system. The implementation of CBDC can potentially extend the benefits of digital payments to a broader section of the population (Banerjee & Sinha, 2023) [2]. Overall, while India's digital payment system continues to evolve, its continued success will depend on improving digital infrastructure, enhancing financial literacy, and addressing security concerns to ensure consumer trust and security. These efforts are essential for realizing the full potential of digital payments to achieve financial inclusion and economic growth in India.

2. Evolution From a Cash-based to a Digital Economy:

The transition from a cash-based to a digital economy signifies a profound transformation primarily driven by advancements in financial technologies, digital payment systems, and evolving consumer behaviours. This shift was influenced by several factors.

2.1 Technological Advances

With the rapid advancement of technology, digital payment systems have significantly improved in terms of efficiency and accessibility. These systems offer greater convenience and security than traditional cash transactions do. The advent of e-wallets and electronic money (e-money) exemplifies this transition, providing consumers with practical and easily accessible payment options that diminish dependence on physical currency (Tarantang *et al*., 2019) [35].

2.2 FinTech Integration

The integration of financial technology (FinTech) has been instrumental in advancing the digital economy. Innovations in FinTech, such as mobile payment systems, blockchain technology, and AI-driven solutions, have transformed traditional banking by enhancing efficiency, bolstering security, and improving customer experience. These technologies have facilitated easier peer-to-peer transactions and micro-lending practices, thereby promoting greater financial inclusivity (Ebirim and Odonkor, 2024; Manta *et al*., 2025) [6, 17].

2.3 Consumer Adoption

Consumer behaviour plays a significant role in the adoption of digital payment methods. For example, in Indonesia, there is notable acceptance of e-wallets among young consumers, primarily because of the convenience and perceived security associated with non-cash transactions. This favourable consumer perception has been crucial to the expansion of the digital payment ecosystem (Galang & Ramdhan, 2023) [8].

2.4 E-commerce Growth

The proliferation of e-commerce has necessitated the establishment of robust electronic payment systems, which are essential components of online commerce. E-commerce, facilitated by digital transformation, has redefined traditional business models and extended market reach through digital channels (Fatonah *et al*., 2023; Fatonah *et al*., 2018) [7].

2.5 Global Economic Inclusion

Innovations in financial technology (FinTech) have markedly advanced global financial inclusion by extending financial services to previously underserved communities. These technological advancements reduce the cost of service delivery and enhance accessibility, particularly in remote or underbanked areas. Mobile and digital banking platforms play a crucial role in facilitating this inclusivity by offering services in regions where traditional banking infrastructure is insufficient (Ebirim & Odonkor, 2024) [6].

2.6 Sustainability and Scalability Challenges

Notwithstanding these advancements, challenges concerning regulatory frameworks, digital literacy, and infrastructure development persist. Ongoing collaboration among governments, technology providers, and financial institutions is crucial for establishing inclusive FinTech ecosystems that are both sustainable and scalable (Ebirim and Odonkor, 2024) [6].

The transition from a cash-based economy to a digital economy represents a complex process driven by technological advancements, evolving consumer preferences, and strategic partnerships aimed at improving financial accessibility and inclusivity.

3. Evolution of Digital Payments in India

The progression of digital payments in India represents a noteworthy trajectory characterized by substantial technological innovations and regulatory measures. Below is a point-wise summary:

3.1 Early Initiatives

1. **Electronic Clearing Service (ECS):** Introduced in the late 1990s, the Electronic Clearing Service (ECS) represented an initial advancement towards the automation of payment systems, enabling the efficient processing of bulk transactions.
2. **National Electronic Fund Transfer (NEFT):** The Reserve Bank of India (RBI) introduced a system to facilitate one-to-one fund transfers between any bank branch and any other bank branch (Manta *et al*., 2025) [17].
3. **Real-Time Gross Settlement (RTGS):** Designed to facilitate real-time and gross-based settlement of funds, this system primarily targets high-value transactions, thereby enhancing the efficiency of payment systems (Shree *et al*., 2021) [29].

3.2 Role of the Regulatory Bodies

4 **Reserve Bank of India (RBI):** As the central authority, the Reserve Bank of India (RBI) has played a pivotal role in promoting a secure and efficient payment system, spearheading initiatives such as the National Electronic Funds Transfer (NEFT) and Real-Time Gross Settlement (RTGS) (Ebirim & Odonkor, 2024; Manta *et al*., 2025) [6, 17].

5 **National Payments Corporation of India (NPCI):** Established under the auspices of the Reserve Bank of India (RBI), this initiative aims to consolidate and integrate various payment systems while establishing standards for retail payments and settlements (Gochhwal 2017) [9].

5.1 Crucial Milestones

6 **Introduction of the Unified Payments Interface (UPI):** The Unified Payments Interface (UPI)

significantly transformed the financial landscape by enabling access to multiple bank accounts through a single mobile platform. This innovation streamlined real-time payment systems and facilitated the growth of digital transactions (Gochhwal 2017) [9].

7 **Aadhaar-enabled Payments:** The integration of biometric and Aadhaar identification systems aims to facilitate direct benefit transfers and improve accessibility, particularly for unbanked populations (Ebirim & Odonkor, 2024) [6].

8 **BHIM App Launch:** The BHIM application developed by NPCI has further streamlined UPI transactions and aims to enhance the adoption of digital payments across diverse demographic groups (Gochhwal, 2017) [9].

9 **Demonetization (2016):** While not a technological initiative, demonetization significantly expedited the adoption of digital payment systems by creating a cash shortage that incentivized individuals and businesses to embrace digital methods (Pal *et al*., 2018) [23].

Each of these initiatives and milestones has contributed significantly to the swift transformation of India's digital payment landscape, aligning with global trends and enhancing financial inclusion. This progression exemplifies a coherent convergence of technological advancement, regulatory foresight, and socioeconomic strategies aimed at fundamentally reshaping the payment systems within the country.

4. Current Landscape of Digital Payments in India

This document provides a comprehensive analysis of the current status of digital payment systems in India.

4.1 Major Digital Payment Methods

The primary digital payment methods in India encompass the Unified Payments Interface (UPI), mobile wallets, card payments, and the Immediate Payment Service (IMPS). These methods have fundamentally transformed the execution of financial transactions, thereby enhancing the speed and convenience of payments. Notably, UPI has experienced substantial growth, owing to its efficient real-time peer-to-peer transactions and interoperability (Patnaik *et al*., 2023) [26].

4.2 Growth Statistics and Adoption Trends

India's fintech services adoption rate is 87%, markedly surpassing the global average of 64% (Das and Das, 2020) [5]. This rapid growth can be attributed to the increasing penetration of smartphones and internet services. Additionally, the widespread adoption of mobile payments signifies India's advancement in digital payment solutions, outpacing developed countries (Kumar *et al*. 2020) [15].

4.3 Government Initiatives

Several governmental initiatives have been instrumental in advancing digital payment systems. The Digital India Campaign, along with the demonetization policy implemented in 2016, significantly facilitated the transition from cash-based transactions to digital payments. Furthermore, Pradhan Mantri Jan-Dhan Yojana (PMJDY) seeks to enhance financial inclusion by providing bank accounts to the underprivileged, thereby integrating them into the digital economy (Siek & Sutanto, 2019) [30].

4.4 Role of Fintech Startups

Fintech startups, such as Paytm, PhonePe, and Google Pay, have played a pivotal role in advancing the adoption of digital payment systems. These entities have disrupted conventional banking practices by providing innovative and user-friendly solutions that address the needs of diverse demographic groups, including those in remote and underbanked regions (Goswami *et al*. 2022) [10]. Furthermore, partnerships between fintech companies and traditional banks have augmented the reach and functionality of digital banking services (Bhasin and Rajesh, 2021) [3].

India's digital payment ecosystem is experiencing continuous expansion driven by substantial technological advancements, supportive government policies, and the proactive involvement of fintech companies in promoting financial inclusivity.

5. Technological and Regulatory Drivers

This section of the study is organized into four distinct subsections: the Role of UPI and Bharat Bill Payment System (BBPS), the impact of Aadhaar and e-KYC, the policies and security frameworks of the RBI (including PCI-DSS and tokenization), and the challenges of cybersecurity and fraud prevention. Each of these subsections is discussed in detail below:

5.1 Role of UPI and the Bharat Bill Payment System (BBPS)

UPI and BBPS have significantly transformed digital payments in India by establishing a seamless and interoperable framework for transactions. UPI facilitates instantaneous money transfers between bank accounts via mobile devices, thereby enhancing accessibility and promoting financial inclusion (Arner *et al*. 2020) [1]. The BBPS provides bill payment services across India, enabling customers to pay utility bills, DTH, and other related services through a unified platform, thereby further simplifying the payment ecosystem (Arner *et al*., 2020) [1].

5.2 The Impact of Aadhaar and e-KYC

Aadhaar and e-KYC substantially enhance the efficiency of the customer identification process within financial services by minimizing the time and effort necessary for verification and improving customer experience through electronic verification (Parate *et al*. 2023) [25]. These mechanisms ensure greater accuracy in identity authentication and contribute to the mitigation of fraud risks, thereby fortifying the overall security framework in the fintech and banking sectors (Parate *et al*. 2023) [25].

5.3 RBI's Policies and Security Frameworks (PCI-DSS, Tokenization)

The Reserve Bank of India (RBI) has implemented comprehensive security frameworks, including PCI-DSS compliance, to ensure secure management of consumer data and financial transactions (Kothandapani, 2024) [13]. Additionally, the RBI has adopted tokenization to replace sensitive credit card information with unique tokens, thereby reducing the risk of fraud and data breaches in digital transactions (Kothandapani, 2024) [13].

5.4 Cybersecurity Challenges and Fraud Prevention

The fintech sector faces substantial cybersecurity

challenges, including phishing, malware, data breaches, and insider threats, which necessitate the implementation of robust security measures (Olaiya *et al*. 2024) [22]. Cybersecurity strategies such as encryption, multi-factor authentication, AI-driven threat detection, and blockchain technology are vital for mitigating cyber threats and preventing fraud (Olaiya *et al*., 2024; Varalakshmi *et al*., 2024) [22, 38]. Adherence to global cybersecurity standards and adoption of proactive incident response strategies are crucial for enhancing resilience and ensuring the protection of financial data and assets (Uzougbo *et al*., 2024) [37].

6. Challenges in Digital Payment Adoption

The implementation of digital payment systems in India encounters several challenges and obstacles, as elaborated on below.

6.1 Digital Divide (Rural vs. Urban Adoption): The digital divide continues to pose a substantial challenge in the adoption of digital payments, as there is a pronounced disparity between rural and urban regions. Urban areas typically benefit from superior access to technological infrastructure and education, which facilitates the adoption of digital payments. Conversely, rural areas frequently encounter limited access to the internet and digital literacy, thereby impeding adoption rates (Putrevu & Mertzanis, 2023) [27].

6.2 Infrastructure Limitations (Internet Penetration, Smartphone Access): The efficacy of digital payment systems is predominantly contingent upon reliable Internet connectivity and the widespread availability of smartphones. In regions characterized by low Internet penetration, particularly within developing nations, the adoption of digital payment methods is considerably impeded. Furthermore, restricted access to smartphones among certain demographic groups further limits the potential user base for digital payments (Susanto *et al*. 2022) [34].

6.3 Trust and Security Concerns: Trust is a pivotal factor that influences the adoption of digital payment systems. Users frequently express concerns about the security and privacy of their financial information during digital transactions. Such apprehensions may discourage potential adopters as individuals remain cautious about fraud and data breaches (Linh & Huyen, 2025) [16]. Establishing trust is therefore imperative, with strategies such as the implementation of enhanced security protocols, the establishment of transparent policies, and the provision of education on security features serving to alleviate these concerns (Norbu *et al*., 2024) [21].

6.4 Regulatory and Compliance Hurdles: Regulatory and compliance challenges present significant obstacles. Various countries have enforced distinct regulations concerning digital payments, which can impact international and cross-border transactions. Adhering to these regulations necessitates digital payment providers to navigate intricate legal frameworks, a process that can be both costly and time-consuming. Consequently, this may hinder innovation and decelerate the introduction of new digital payment solutions (Masihuddin *et al*. 2017) [18].

7. Literature Review

Numerous studies have been conducted by researchers and academics on the various aspects of digital payments in India. For this study, some of the most pertinent and recent studies were reviewed as outlined below.

Bhura *et al*. (2020) [4] studied how electronic payment systems have changed and what the future holds for them in India. This study examines the journey from the early electronic fund transfer systems of the Reserve Bank of India (RBI) to digital payments such as Internet banking and the Unified Payments Interface (UPI) in 2016. The removal of high-value currency notes sped up digital transactions. This study explores government actions, RBI rules, and technologies that support digital payments. It also discusses issues such as cybersecurity and digital skills, while pointing out growth opportunities with biometric authentication and blockchain. This study highlights how digital payments affect India's economy and financial inclusion, emphasizing the need to balance new ideas with regulations.

Walasange and Trimukhe (2023) [39] analysed digital payment transactions in India from 2017 to 2022. This study examines the adoption of digital payments across the banking, retail, and e-commerce sectors, driven by government policies, technology, and consumer behaviour during the COVID-19 pandemic. Key growth drivers include policy support, technological infrastructure, and smartphone penetration, whereas the challenges include awareness gaps and technical issues. This study emphasizes the need for institutional support and highlights the role of digital payments in enhancing financial inclusion and transforming India's economy.

Pandey (2022) [24] studied digital payment systems and how people in India feel about them. This study examines the change from cash use to digital payments. The 2016 demonetization and the launch of Reliance Jio helped more people use digital payments by making the internet more accessible. The COVID-19 pandemic sped this change. This study focused on e-wallets, such as G-pay, PhonePe, BHIM, and Paytm, gathering data from 200 people in different cities in India. The results showed that age, and not education, was a major factor in the use of digital payments, with young people being the main users. People liked digital payments because they were convenient, and they learned about them mostly through word-of-mouth. The study concluded that how people view payment tools affects their behaviour, feedback, and opinions about digital payments.

Kumar and Subhash (2023) [14] looked at India's digital payment system. They studied digital payments in India after demonetization and their benefits of making payments digital. This study also examines the effects of digital payments and the challenges of going cashless. They used data from RBI circulars, papers, and news articles to analyse different digital payment methods such as banking cards, USSD, AEPS, mobile banking, UPI, PoS, mobile wallets, Internet banking, NEFT, RTGS, ECS, and IMPS. This study predicts that India's digital payment market will reach US$1 trillion by 2023 and grow by 300% by 2025. Digital payments save time, are easy to access, and have lower risks, but face challenges such as people preferring cash, a lack of computer skills, few POS machines, and security issues. The study concludes that digital payment technology has improved banking and helped move towards a cashless society. It also highlights the need for better public

education on the use of technology and staying secure.

Khando *et al*. (2023) [12] reviewed studies on new digital payment methods and their challenges. They divided digital payments into card payments, e-payments, mobile payments, and cryptocurrencies. They identified five main challenges: social (trust issues), economic (costs), technical (security and privacy), awareness (knowledge of how to use digital tools), and legal (cryptocurrency laws). They reviewed 58 studies from Web of Science and Scopus using an 8-step process. The results showed that technical challenges were the most common (39%), with trust being a major social issue. This study helps researchers, practitioners, and policymakers understand digital payment trends and challenges.

Mishra and Rajora (2018) [19] looked at how young people in Mumbai use digital payment systems. They gathered information from 48 people by using questionnaires. Their analysis showed that both men and women used UPI similarly. Among respondents, 74.5% used digital payment systems, with cards and POS systems being the most popular. Users found these systems quick and easy to use, and 58.3% supported making them mandatory. This study highlights India's shift from using cash to digital payments, which is becoming popular even with street vendors. This research suggests that, with good planning, digitization could help India compete with developed countries.

Singh *et al*. (2024) [31] studied digital payment systems in India. They examined how these systems grew as a result of government actions and new technologies. This study used data from the RBI reports and government websites from 2017 to 2024. It focused on what helped digital payments grow, what they were made of, and their share of all payments in India. The key growth factors were government policies, technology, online shopping, and people who knew more about digital payment. Credit transfers, especially UPI, were the most common, whereas RTGS had the highest value. Digital payments went from 92.57% to 99.60% of all payment numbers between 2017-18 and 2023-24. Their values rose from 94.36% to 97.11%. This study shows India's move from paper to digital payments and stresses the need to solve security issues to maintain consumer trust.

Tyagi *et al*. (2022) [36] looked at UPI apps in India, like GooglePay, PhonePe, Amazon Pay, Paytm, and BHIM. They used survey data from 82 individuals in Pune. The study checks the UPI's growth since it started in 2016 by NPCI, showing that it is popular because it is easy to use and safe. It examines trends in the UPI industry, such as how banks join and how many transactions occur. Using different data collection methods, the study determined what users liked and the market share of each app. They conclude that digital payments are increasing in India, with PhonePe being the most used, followed by Google Pay, Paytm, Amazon Pay, and BHIM UPI. This study indicates that UPI can grow more because of its benefits, and that more people use it.

Singh (2022) [32] examines how digital payment systems have changed in India. This study aims to understand how this sector has grown using PESTEL analysis to identify positive and negative points. It uses information from sources, such as RBI circulars and research papers. This study covers three phases of digital payment development: Phase 1 (2004-2009) with the National Financial Switch and AADHAR, Phase 2 (2010-2015) with IMPS, RuPay Card, and mobile banking, and Phase 3 (2016-2021) with UPI, Bharat QR, and e-Rupee. The PESTEL analysis examines the political, economic, social, technological, environmental, and legal factors that affect the sector. This study identifies the factors that impact digital payment growth, such as government actions and security issues. It concludes that India's digital payment systems are changing rapidly, with systems such as UPI transforming the sector. It also highlights the growth potential and challenges in cybersecurity and complaint-handling.

Jain (2023) [11] examined the growth of digital payment systems in India. This study focuses on India's move towards using less cash through digital payments. It discusses internet banking, mobile banking, and mobile wallets. It also examines how demonetization and COVID-19 have affected the use of digital payments. The study mentions government efforts, such as NPCI's mobile payment system. It highlights benefits such as transparency and convenience, but also points out problems such as security issues and low-tech knowledge. This study reviews previous research on digital payments and considers whether these systems will work well in India in the future. It concludes that digital payments have grown significantly and suggests more research on transaction fees to help build a strong digital economy.

8. Research Gap

A possible gap was observed in the current study. Several studies have examined the growth, use, and problems associated with digital payment systems in India. However, little research has been conducted on the long-term effects of digital payment. Future research could examine how digital payments affect financial inclusion, income inequality, and economic growth in different groups and areas of India.

9. Significance of the Study

Digital payment systems in India, such as the Unified Payment Interface (UPI), represent a significant step forward. They have lower costs, are easy to use, settle payments quickly, and are secure. This helps more people access financial services (Gochhwal 2017) [9]. Across Asia, digital payments have changed how people handle money, boosting online shopping due to increased Internet and mobile use (Susanto *et al*., 2022) [34]. India is pushing for fewer cash transactions to make the economy more efficient and grow, highlighting the importance of digital payments (Nandru *et al*., 2023) [20]. The Reserve Bank of India (RBI) introduced Central Bank Digital Currency (CBDC) to make the financial sector more efficient and inclusive by using current digital payment systems (Banerjee & Sinha, 2023) [2]. During demonetization, people's willingness to adopt digital payments is affected by their preference for cash, showing challenges in adoption (Sivathanu 2018) [33]. The extended Technology Acceptance Model (TAM) indicates that financial literacy, trust, privacy, service quality, and ease of use affect digital payment adoption, indicating areas for policy improvement (Patnaik *et al*., 2023) [26]. This study of digital payment systems offers important insights for policymakers, businesses, and users to use these systems for economic and social benefits.

10. Objective of the Study

The objectives of this study are (i) to review the digital

payment system in India, and (ii) to analyse the status of the digital payment system in India along with the RBI's Digital Payment Index from the financial year 2017-18 to 2024-25.

11. Research Methodology

The present study is descriptive, qualitative, and analytical by nature. It is purely conducted based on secondary data. the secondary data have been collected from various relevant and recent research articles, journals, research papers, and various annual reports of the RBI. The study period is from 2017-18 to 2024-25. To analyse the numerical data collected from the RBI's annual reports, the researcher used accounting tools, such as trend analysis and CAGR, and statistical tools, such as descriptive statistics. The data have been analysed with the help of MS Excel to achieve the research objectives.

12. Analysis and Discussion

This section presents an overview of the total digital payments in India from 2017-18 to 2024-25, considering both volume and value, along with the RBI's Digital Payment Index in India. A detailed analysis is presented below:

12.1 Overview of Total Digital Payments in India at a Glance from 2017-18 to 2024-25 (Volume)

Table 1: Overview of Total Digital Payments in India at a Glance from 2017-18 to 2024-25 (Volume)

Financial Year	Volume (Lakh)	Trend %
2017-18	1,45,902	100
2018-19	2,32,602	159.42
2019-20	3,40,026	233.05
2020-21	4,37,445	299.82
2021-22	719768	493.32
2022-23	1139382	780.92
2023-24	1644302	1,126.99
2024-25	2219814.63	1,521.44
Mean	859905.2038	
Median	578606.5	
Standard Deviation	747800.068	
Kurtosis	-0.158254933	
Skewness	0.997488197	
Range	2073912.63	
CAGR	699%	

(**Source:** Compiled by the researcher from various Annual reports of the RBI)

Observation

An analysis of the data from abovetable-1 on India's digital payments from 2017-18 to 2024-25, with a focus on transaction volume, reveals significant insights. The volume of digital payment transactions increased exponentially from 1,45,902 lakh in 2017-18 to 22,19,814.63 lakh in 2024-25, marking a 15.2-fold increase over seven years. The compound annual growth rate (CAGR) of 699% underscores the rapid adoption of digital payments. Post-2020, growth accelerated markedly, with a sharp increase to 4,37,445 lakhs in 2020-21, representing 299.82% of the 2017-18 volume. From 2021-22 onwards, growth continued to accelerate, exceeding 11,39,382 lakhs in 2022-23 and 16,44,302 lakhs in 2023-24. Trend percentage analysis indicated 59.42% growth in 2018-19 compared to 2017-18, with 2024-25 volumes reaching 1,521.44% of the base year (2017-18). Statistical insights revealed a mean transaction volume of 8,59,905 lakhs, with a median of 5,78,606 lakhs, indicating right-skewed growth owing to higher recent volumes. A standard deviation of 7,47,800 lakhs suggests high volatility in transaction volumes. A skewness of 0.997 confirms positive skewness, indicating growth concentration in later years, whereas a kurtosis of -0.158 suggests a slightly flatter distribution than normal, implying fewer extreme outliers. Key drivers of this growth include the adoption of the Unified Payments Interface (UPI) post-2016, which became the dominant mode of digital transactions. Government initiatives such as Digital India, 2016 demonetization, and financial inclusion policies have also played a significant role. The COVID-19 pandemic further accelerated the shift towards contactless payments owing to the lockdowns. Additionally, fintech innovations, exemplified by the rise of platforms such as Paytm, PhonePe, and Google Pay, along with regulatory support from the Reserve Bank of India (RBI), have contributed to this growth. India's digital payments ecosystem has experienced exponential growth driven by UPI, government policies, and evolving consumer behaviour. This trend suggests continued expansion, with projected volumes for 2024-25 being 15 times higher than those for 2017-18. The high CAGR of 699% and right-skewed distribution underscore the rapid digital transformation within India's financial landscape.

12.2 Overview of Total Digital Payments in India at a Glance from 2017-18 to 2024-25 (value)

Table 2: Overview of Total Digital Payments in India at a Glance from 2017-18 to 2024-25 (value)

Financial Year	Value (Rs. in Crore)	Trend %
2017-18	13,69,86,734	100
2018-19	16,37,13,425	119.51
2019-20	16,19,69,379	118.24
2020-21	14,14,59,089	103.26
2021-22	17,44,01,233	127.31
2022-23	20,86,84,872	152.34
2023-24	24,28,23,799	177.26
2024-25	286200103	208.93
Mean	189529829.3	
Median	169057329	
Standard Deviation	52479679.33	
Kurtosis	0.052612093	
Skewness	1.00690495	
Range	149213369	
CAGR	1371%	

(**Source:** Compiled by the researcher from various Annual reports of the RBI)

Observation

Presented herein are observations derived from Table 2 on India's digital payments (value in ₹ crore) spanning from 2017-18 to 2024-25, with a particular emphasis on transaction value. The overall growth in transaction value is noteworthy, increasing from ₹13,69,86,734 crore in 2017-18 to ₹28,62,00,103 crore in 2024-25, more than doubling, representing 208.93% of the base year. The compound annual growth rate (CAGR) is 1,371%, an exceptionally high figure attributed to the surge in volume driven by the Unified Payments Interface (UPI). Trend analysis indicates that during 2018-19 and 2019-20, growth was modest, at approximately 119-118% of the 2017-18 levels. In 2020-21, amidst the COVID-19 pandemic, there was a decline to

103.26%, possibly due to a reduction in high-value transactions. Post-2021 recovery was robust, with 2021-22 reaching 127.31% of the baseline year. The projection for 2024-25 is 208.93%, which is the highest recorded value. Statistical insights revealed that the mean transaction value is ₹1,89,529.8 crore. The median value of ₹1,69,057.3 crore is less than the mean, indicating a right-skewed distribution with higher recent values. The standard deviation is ₹52,479.7, reflecting high volatility, particularly after 2021. Skewness is 1.006, confirming right-skewed growth with higher values in later years. The kurtosis is 0.052, suggesting a near-normal distribution, albeit with slight peaking. Key trends and drivers indicate that UPI dominance includes small-ticket, high-frequency UPI transactions that have driven volume, but value growth is slower than volume because of the low average ticket size. COVID-19 impact (2020-21) While the value dipped, volume surged due to a shift to smaller payments. Post-2021 recovery includes increased adoption in high-value sectors such as e-commerce, business-to-business (B2B), and government transactions. The regulatory push includes the Reserve Bank of India's (RBI) focus on digital infrastructure, including UPI Lite and the Central Bank Digital Currency (CBDC) pilot, which has been significant. A comparison with volume data shows that the volume grew faster, at 1,521%, compared to 209%, indicating smaller average transaction sizes, likely due to UPI micropayments. A CAGR of 1,371% for value versus 699% for volume suggests that high-value transactions are also increasing, although not as sharply as volume. Digital payment values are rising, albeit at a slower pace than volumes, reflecting UPI's dominance in small-ticket transactions. The post-2021 recovery demonstrates resilience, with projections for 2024-25 expected to exceed ₹28.6 lakh crore. The right-skewed data indicate accelerated growth in recent years, driven by fintech innovation and government policies.

12.3 RBI- Digital Payment Index from 2017-18 to 2024-25

Table 3: RBI- Digital Payment Index from 2017-18 to 2024-25

Financial Year	Index
2017-18	100
2018-19	153.47
2019-20	207.84
2020-21	270.59
2021-22	349.3
2022-23	395.57
2023-24	445.5
2024-25	493.22

(**Source:** Compiled by the researcher from various Annual reports of the RBI)

Observation

Table 3 shows the observations from the Reserve Bank of India's (RBI) Digital Payment Index for the period 2017-18 to 2024-25 are detailed as follows. The index exhibited consistent growth, rising from a baseline of 100 in 2017-18 to 493.22 in 2024-25, indicating a significant increase in the adoption of digital payments in India. During the initial years (2017-18 to 2021-22), the index more than tripled, reaching 349.3, reflecting a strong policy impetus, including initiatives such as demonetization, the implementation of the Unified Payments Interface (UPI), and financial inclusion schemes. Post-2021-22, the growth rate experienced a slight deceleration, possibly due to market saturation or the higher base effect. The growth rates for the subsequent years are as follows: 13.2% in 2022-23 (349.3 to 395.57), 12.6% in 2023-24 (395.57 to 445.5), and 10.7% in 2024-25 (445.5 to 493.22). The index increased by 393% from 2017-18 to 2024-25, underscoring India's rapid transition towards digital payment systems. The observed surge is correlated with the expansion of UPI, fintech innovations, governmental initiatives such as Digital India, and enhancements to the RBI payment infrastructure. The RBI-DPI highlights the accelerating digital payment ecosystem in India, which is characterized by sustained growth driven by technological adoption and regulatory support. Although the growth rate has been slightly moderated in recent years, the overall trajectory remains strongly positive.

13. Findings of the Study

Drawing upon the discussions presented, the principal findings of the study concerning digital payment systems in India are as follows:

13.1 Exponential Growth in Digital Payment Volume

- The transaction volume experienced a significant increase from 1,45,902 lakh in the fiscal year 2017-18 to 22,19,814.63 lakh in 2024-25, representing a 15.2-fold growth over eight years.
- A compound annual growth rate (CAGR) of 699% indicates a rapid rate of adoption.

13.2 Significant Increase in Transaction Value

- The value increased from ₹13,69,86,734 crore in 2017-18 to ₹28,62,00,103 crore in 2024-25, effectively more than doubling.
- The compound annual growth rate (CAGR) of 1,371% in value is attributed to a significant increase in Unified Payments Interface (UPI) transactions.

13.3 RBI Digital Payment Index Shows Consistent Growth

- The index increased from 100 in the 2017-18 period to 493.22 in 2024-25, representing a 393% rise.
- In recent years, the growth rate has experienced slight moderation; however, it continues to exhibit a robust positive trajectory.

13.4 Key Drivers of Growth

The adoption of the Unified Payments Interface (UPI), along with government initiatives such as Digital India and demonetization, has been significantly influenced by the COVID-19 pandemic, which has accelerated the transition to contactless payments. Additionally, innovations in financial technology and regulatory support from the Reserve Bank of India (RBI) have further facilitated this shift.

13.5 Trends in Transaction Characteristics

The volume increased at a significantly higher rate than the value (1,521% compared to 209%), suggesting a trend towards smaller average transaction sizes. This pattern underscores the dominance of UPI in facilitating small-ticket high-frequency transactions.

13.6 Challenges and Considerations
- Digital divide between rural and urban areas.
- Infrastructure limitations (internet penetration and smartphone access).
- Trust and security concerns.
- Regulatory and compliance hurdles.

13.7 Impact on Financial Inclusion
- Digital payment systems have contributed significantly to enhancing financial inclusion, particularly in rural regions.
- Mobile money and digital wallets have facilitated the integration of banked and unbanked populations.

13.8 Future Outlook
- Projections indicate a continued expansion, with volumes for the 2024-25 period anticipated to be 15 times greater than those recorded in 2017-18.
- The implementation of a Central Bank Digital Currency (CBDC) is intended to further enhance financial inclusion.

The findings underscore the swift transformation of India's digital payment landscape propelled by technological innovation, governmental policies, and evolving consumer behaviour. The study highlights the substantial growth in both the volume and value of digital transactions while also identifying challenges that must be addressed to ensure the sustained development of the digital payment ecosystem.

14. Limitations of the Study
The primary limitations of this study on digital payment systems in India are as follows:

1. **Reliance on Secondary Data:** The research relies exclusively on secondary data derived from RBI reports and other published sources. This reliance constrains the capacity to obtain novel insights or primary data directly from users and stakeholders.
2. **Limited Time Frame:** The analysis encompasses the period from 2017-18 to 2024-25. While this timeframe offers a comprehensive overview of recent trends, it may not adequately reflect long-term historical patterns or future projections beyond 2025.
3. **Focus on Aggregate Data:** This study investigates the aggregate volumes and values of digital payments; however, it does not disaggregate the data by specific payment methods, demographic groups, or geographical regions. This limitation hinders the ability to conduct a more detailed analysis.
4. **Lack of Qualitative Insights:** As a quantitative study reliant on statistical data, it does not encompass qualitative elements such as user experiences, the challenges encountered by various stakeholders, or cultural factors influencing adoption.
5. **Potential Data Limitations:** This study utilizes official data from the Reserve Bank of India (RBI), which may possess inherent limitations regarding comprehensiveness or accuracy, particularly concerning projections for future years.
6. **Limited International Comparison:** This study exclusively examines India, without providing a comparative analysis of digital payment trends in other countries for contextual understanding.
7. **Exclusion of Certain Factors:** The analysis fails to consider external factors, such as regulatory changes, technological disruptions, or economic shocks that may influence the adoption of digital payments.
8. **Potential Bias in Projections:** Projections for the 2024-25 period are derived from historical trends and may not comprehensively account for potential disruptions or alterations in growth trajectories.

These limitations should be considered when interpreting the findings and conclusions of this study. Future research could address some of these gaps and offer a more comprehensive analysis of India's digital payment landscape.

15. Conclusion
The digital payment landscape in India has experienced a significant transformation propelled by technological advancements, government initiatives, and evolving consumer behaviours. This study offers a comprehensive analysis of the evolution and current state of digital payments in India from 2017-18 to 2024-25. There has been an exponential increase in digital payment volume, with a 15.2-fold increase over seven years and a compound annual growth rate (CAGR) of 699%. The transaction value more than doubled from 2017-18 to 2024-25, with a CAGR of 1,371%. The Reserve Bank of India's Digital Payment Index has consistently grown, increasing from 100 in 2017-18 to 493.22 in 2024-25. Key drivers of this growth include the adoption of a Unified Payments Interface (UPI), government initiatives, the effects of the COVID-19 pandemic, and fintech innovations. Trends indicate faster volume growth compared to value, suggesting a shift towards smaller, more frequent transactions. Financial inclusion has been enhanced, particularly in rural areas, through mobile money and digital wallets. The study also highlights challenges such as the digital divide, infrastructure limitations, and security concerns. Future prospects include the potential impact of Central Bank Digital Currency (CBDC) and the continued expansion of digital payment systems. This transformation in India's payment landscape has significant implications for financial inclusion, economic growth, and the broader fintech ecosystem. As digital payments continue to evolve, addressing challenges and leveraging opportunities is crucial for sustaining this growth trajectory and realizing the full potential of digital financial services in India.

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