



# Growth, Opportunities, And Challenges Of UPI In India's Digital Economy

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## **Abstract:**

The Indian digital payment ecosystem has undergone a significant transformation in recent years, particularly after the government's Digital India initiatives and demonetization. Among various platforms, the Unified Payments Interface (UPI), launched by the National Payments Corporation of India (NPCI) in 2016, has emerged as a key driver of retail digital transactions. This study examines the growth, opportunities, and challenges of UPI as a digital payment service in India. Using secondary data from RBI, NPCI, and other published sources, the paper applies a SWOT analysis to assess UPI's strengths, weaknesses, opportunities, and threats. Findings reveal that UPI has experienced exponential growth in both volume and value of transactions, owing to its simplicity, interoperability, and cost-effectiveness. It has significantly enhanced financial inclusion by enabling small businesses and individuals, even in rural areas, to adopt cashless transactions. However, challenges such as cybersecurity risks, transaction failures, limited awareness in rural areas, and dependency on banking infrastructure persist. Opportunities lie in expanding internet penetration, government policies supporting a cash-lite economy, and the widening scope of services such as bill payments, insurance, and overdraft facilities through UPI 2.0. Despite threats from fintech competition and consumer reliance on cash, UPI continues to dominate retail digital payments, contributing over half of India's total digital transactions. The study concludes that UPI is not only a technological innovation but also a strategic instrument to advance financial inclusion and India's transition toward a digital economy.

**Index Terms** - UPI, SWOT, Cashless Economy, NPCI

## **I. INTRODUCTION**

India's financial sector is undergoing unprecedented transformation, driven by technological innovation and policy initiatives aimed at building a digital economy. Over the past decade, the Indian banking system has shifted from conventional, paper-based modes of operation to technology-driven services that emphasize speed, security, and efficiency. The launch of the *Digital India* initiative in 2015, followed by the demonetization of high-value currency notes in 2016, created strong momentum for digital transactions and catalyzed the growth of electronic payment systems. These developments have significantly altered consumer behavior and reshaped the payment ecosystem by fostering a shift toward mobile-enabled, cashless transactions. Among various digital payment platforms, the **Unified Payments Interface (UPI)**, developed by the National Payments Corporation of India (NPCI) in 2016, has emerged as a revolutionary instrument. Designed as an interoperable, mobile-first payment solution, UPI allows instant peer-to-peer (P2P) and peer-to-merchant (P2M) transfers through a simple Virtual Payment Address (VPA), thereby

eliminating the need to disclose sensitive banking credentials. The flexibility of linking multiple bank accounts to a single application, coupled with services like bill payments, QR-based transfers, and recurring mandates, makes UPI a robust alternative to traditional banking channels and card-based transactions. The success of UPI can be attributed to several factors: rising smartphone penetration, affordable internet access, supportive government policies, and a growing demand for cashless solutions in both urban and rural markets. Its adoption has been further accelerated by the COVID-19 pandemic, during which contactless digital payments became a necessity for individuals and businesses. According to Reserve Bank of India (RBI) and NPCI data, UPI now contributes to more than half of India's retail digital transactions by volume, underscoring its role as the backbone of the country's digital payment infrastructure. At the same time, UPI's rapid growth presents new challenges. Issues such as cyber security threats, transaction failures, technical glitches, and limited awareness in rural and semi-urban areas remain obstacles to achieving universal adoption. Moreover, the transaction cap of ₹2,00,000 restricts its role in high-value transfers, while the absence of a strong grievance redressal mechanism poses risks to consumer confidence. The emergence of competing fintech solutions and evolving regulatory frameworks further adds to the complexity of UPI's growth trajectory. In this context, it becomes important to critically assess UPI's role in advancing financial inclusion and supporting India's transition to a cash-lite economy. This study seeks to explore the growth and progression of UPI in retail digital payments, assess its strategic position in the broader digital payment ecosystem, and evaluate its strengths, weaknesses, opportunities, and challenges (SWOT). The findings aim to highlight UPI's contribution as both a technological innovation and a policy-driven instrument for reshaping India's financial landscape. The research is limited to the Indian context, with a primary focus on UPI's performance in the **retail digital payment sector**. It does not attempt to measure user perceptions directly through primary surveys but instead relies on secondary data and expert studies to draw conclusions.

## II. Background of the Study

The evolution of India's payment ecosystem reflects the broader transformation of its economy through digitization. Traditionally, India has been a cash-dominated society, where cash was the preferred medium for both small and large-value transactions. However, the inefficiencies of cash-based systems—including high transaction costs, lack of transparency, and the risk of theft or counterfeit currency—highlighted the urgent need for a more efficient and secure payment infrastructure. In response, the Reserve Bank of India (RBI) and the Indian Banks' Association (IBA) established the **National Payments Corporation of India (NPCI)** in 2008, under the provisions of the *Payment and Settlement Systems Act, 2007*. NPCI was envisioned as an umbrella organization to design and operate retail payment systems that could integrate banking services with digital technology. Over time, NPCI introduced innovative payment products such as Immediate Payment Service (IMPS), Aadhaar Enabled Payment System (AePS), Bharat Bill Payment System (BBPS), and finally, the **Unified Payments Interface (UPI)** in 2016. UPI represented a breakthrough by providing a single digital interface for multiple bank accounts, enabling real-time fund transfers on a 24×7 basis. Unlike earlier payment systems, UPI offered simplicity and interoperability by

allowing users to transact through mobile apps without requiring extensive banking knowledge or infrastructure. Its reliance on Virtual Payment Addresses (VPAs) enhanced both convenience and privacy, while its integration with QR codes and merchant platforms positioned it as a tool for widespread retail adoption. The Government of India's *Digital India* campaign, launched in 2015, provided further impetus to the adoption of digital payments by emphasizing financial inclusion, mobile connectivity, and e-governance. The sudden demonetization exercise in November 2016, which withdrew high-value currency notes from circulation, further accelerated consumer reliance on digital alternatives. In this environment, UPI quickly gained popularity, growing from 17.8 million transactions in 2016–17 to over 22 billion transactions in 2020–21, as per NPCI statistics. Despite this exponential growth, the digital payment ecosystem in India still faces barriers. Cyber security vulnerabilities, lack of digital literacy, rural-urban disparities in internet access, and resistance to moving away from cash culture remain pressing challenges. Furthermore, competition from global fintech companies, evolving consumer expectations, and regulatory considerations create both opportunities and threats to UPI's future. Thus, UPI is not merely a payment mechanism but a reflection of India's broader socio-economic transition toward a digitally empowered society. Its success depends on continuous innovation, strong regulatory oversight, and inclusive strategies that extend digital financial services to all sections of the population. This backdrop makes the study of UPI's growth and role in India's digital economy both timely and significant.

### III. Statement of the Problem

India's financial sector is at a critical juncture where the transition from a cash-dependent economy to a digital-first economy has become both an opportunity and a necessity. Despite significant progress in promoting digital payments, challenges remain in terms of adoption, security, infrastructure, and inclusivity. The **Unified Payments Interface (UPI)**, launched by NPCI in 2016, was designed as a simple, real-time, and interoperable payment mechanism to overcome the limitations of earlier systems such as NEFT, RTGS, and IMPS. Within a few years, UPI has achieved unprecedented growth, now accounting for more than half of India's digital transactions. However, several problems persist:

1. **Digital Divide** – While urban and semi-urban areas have embraced UPI, large sections of rural India remain underserved due to low internet penetration, lack of smartphone accessibility, and limited awareness of digital payment systems.
2. **Security Concerns** – Rising incidents of cyber fraud, phishing attacks, and weak grievance redressal mechanisms undermine consumer trust, which is critical for sustaining digital adoption.
3. **Transaction Limitations** – The current transaction cap of ₹2,00,000 restricts UPI's role in high-value payments, confining its impact primarily to retail transactions.
4. **Dependence on Banking Infrastructure** – Successful UPI usage requires a functional bank account and linkage to a mobile application. This excludes sections of the unbanked population, thereby limiting its contribution to universal financial inclusion.



5. **Cash-Centric Consumer Behavior** – Despite rapid digital adoption, cash continues to dominate transactions in India, particularly in rural and informal economies, creating resistance to full-scale adoption of UPI.
6. **Competition from Emerging FinTechs** – Global and domestic fintech players are innovating rapidly, creating a competitive environment where UPI must continually adapt to maintain its relevance.

These gaps raise critical questions about UPI's long-term sustainability and its ability to fully support India's transition toward a cashless and inclusive digital economy. While UPI has demonstrated remarkable strengths such as simplicity, interoperability, and scalability, unresolved weaknesses and emerging threats may hinder its ability to achieve nationwide financial inclusion. Hence, there is a pressing need to examine the growth trajectory, opportunities, and challenges of UPI through structured analysis. By conducting a SWOT-based case study, this research aims to identify both the potential and limitations of UPI in reshaping India's digital payment ecosystem, providing insights for policymakers, regulators, and financial institutions to strengthen the digital payment infrastructure.

#### IV. Objectives of the Study

The main objectives of this research are

- To analyze the growth and adoption of the Unified Payments Interface.
- To assess UPI's position within the Indian digital payment ecosystem.
- To evaluate the strengths, weaknesses, opportunities, and threats (SWOT) of UPI.

#### V. Methodology

This study adopts an **exploratory research design** to examine the growth, opportunities, and challenges of the Unified Payments Interface (UPI) as a digital payment service in India. The choice of an exploratory approach is appropriate given the dynamic nature of digital payment systems and the need to understand their evolving impact on India's financial ecosystem.

- Data Sources

The study is based on **secondary data** collected from multiple credible sources, including:

- Published research articles, journals, and case studies related to digital payments and UPI.
- Reports and statistical bulletins from the **Reserve Bank of India (RBI)**.
- Data and publications from the **National Payments Corporation of India (NPCI)**.
- Government policy documents, industry reports, and financial surveys.
- Reliable web-based databases and financial news portals.

- Analytical Framework

To systematically analyze the role and performance of UPI, the study employs the **SWOT analysis framework** (Strengths, Weaknesses, Opportunities, and Threats). This strategic tool enables an evaluation of UPI's internal capabilities and external challenges, thereby providing insights into its sustainability and future prospects in India's digital payment ecosystem.

- **Strengths and Weaknesses** were identified by examining UPI's technological features, operational efficiency, consumer adoption, and limitations in service delivery.
- **Opportunities and Threats** were assessed through an analysis of policy initiatives, competitive market trends, cybersecurity issues, and consumer behavior patterns.

## VI. Digital Payment

Digital payment refers to the process of transferring money or settling transactions through electronic platforms without the direct use of physical cash. It encompasses a wide range of instruments and technologies, including internet banking, mobile banking, debit and credit cards, prepaid wallets, Aadhaar-enabled payment systems, and innovations like the Unified Payments Interface (UPI). Unlike traditional payment methods, digital payments offer real-time processing, transparency, and convenience, making them increasingly popular for both individuals and businesses. The Reserve Bank of India defines digital transactions as those in which at least one leg of the payment—by the payer, receiver, or both—is carried out electronically. With the proliferation of smartphones, affordable internet access, and supportive government initiatives such as *Digital India*, digital payment systems have become a cornerstone of financial inclusion. They not only enable quick and secure fund transfers but also help reduce reliance on cash, curb corruption, and create a more efficient financial ecosystem. According to the **Reserve Bank of India (RBI)**, digital transactions in India recorded a **compound annual growth rate (CAGR) of 61% in volume and 19% in value between 2014 and 2019**. This rapid expansion was fueled by the *Digital India* campaign, increasing smartphone penetration, and the demonetization exercise of 2016, which compelled both individuals and businesses to adopt cashless alternatives. The trend accelerated further during the COVID-19 pandemic, as consumers shifted to contactless and mobile-based payments. By **May 2021**, UPI alone accounted for **58.47% of all digital payment transactions in India**, with over **2.73 billion transactions valued at ₹5.04 trillion** processed in a single month (NPCI, 2021). Despite the dominance of cash in informal sectors, the growth of digital payments highlights a structural shift in consumer behavior and banking practices. Digital payments not only enhance convenience, speed, and transparency but also promote **financial inclusion** by enabling individuals in rural and semi-urban areas to participate in the formal financial system through mobile-based services.

## VII. Unified Payments Interface (UPI)

The Unified Payments Interface (UPI) is a real-time digital payment system developed by the **National Payments Corporation of India (NPCI)** and launched in April 2016. It enables seamless fund transfers between bank accounts through a mobile platform without requiring complex banking details such as account numbers or IFSC codes. Instead, UPI uses a **Virtual Payment Address (VPA)**, along with options like QR codes, Aadhaar, or mobile numbers, to facilitate transactions. Its unique features—such as interoperability across banks, instant settlement, 24×7 availability, and the ability to link multiple bank accounts to a single application—have made it one of the most transformative innovations in India's financial sector. UPI supports both **peer-to-peer (P2P)** and **peer-to-merchant (P2M)** payments, enabling everyday transactions ranging from utility bill payments to e-commerce purchases. Since its inception, UPI has witnessed exponential growth: from just **6.37 million transactions in March 2017** to over **2.73 billion transactions valued at ₹5.04 trillion in March 2021** (NPCI, 2021). Its success lies in its **simplicity, interoperability, and cost-effectiveness**, which have democratized access to digital payments and significantly advanced India's goal of building a cash-lite economy. The Unified Payments Interface (UPI) functions as an interoperable real-time payment system that connects multiple stakeholders within India's digital financial ecosystem. Its working mechanism can be explained through the following steps:

### 1. Registration and Setup

- A user downloads any UPI-enabled application (e.g., BHIM, PhonePe, Google Pay, Paytm).
- The user links one or more bank accounts to the app by verifying details via debit card and mobile number registered with the bank.
- A **Virtual Payment Address (VPA)** or UPI ID is created (e.g., name@bank), which acts as a unique identifier for transactions without revealing bank account details.

### 2. Initiating a Transaction

- The payer enters the receiver's UPI ID, scans a QR code, or uses options like Aadhaar number, mobile number, or account number with IFSC.
- The user specifies the transaction amount and purpose.

### 3. Authentication

- The transaction request is processed through **two-factor authentication**:
- The mobile device registered with the bank.
- The **UPI PIN**, a 4–6 digit code set by the user for authorization.

### 4. Processing by NPCI

- The transaction request is routed through NPCI's UPI switch.
- The payer's bank (remitter bank) and receiver's bank (beneficiary bank) are connected instantly through this interoperable network.

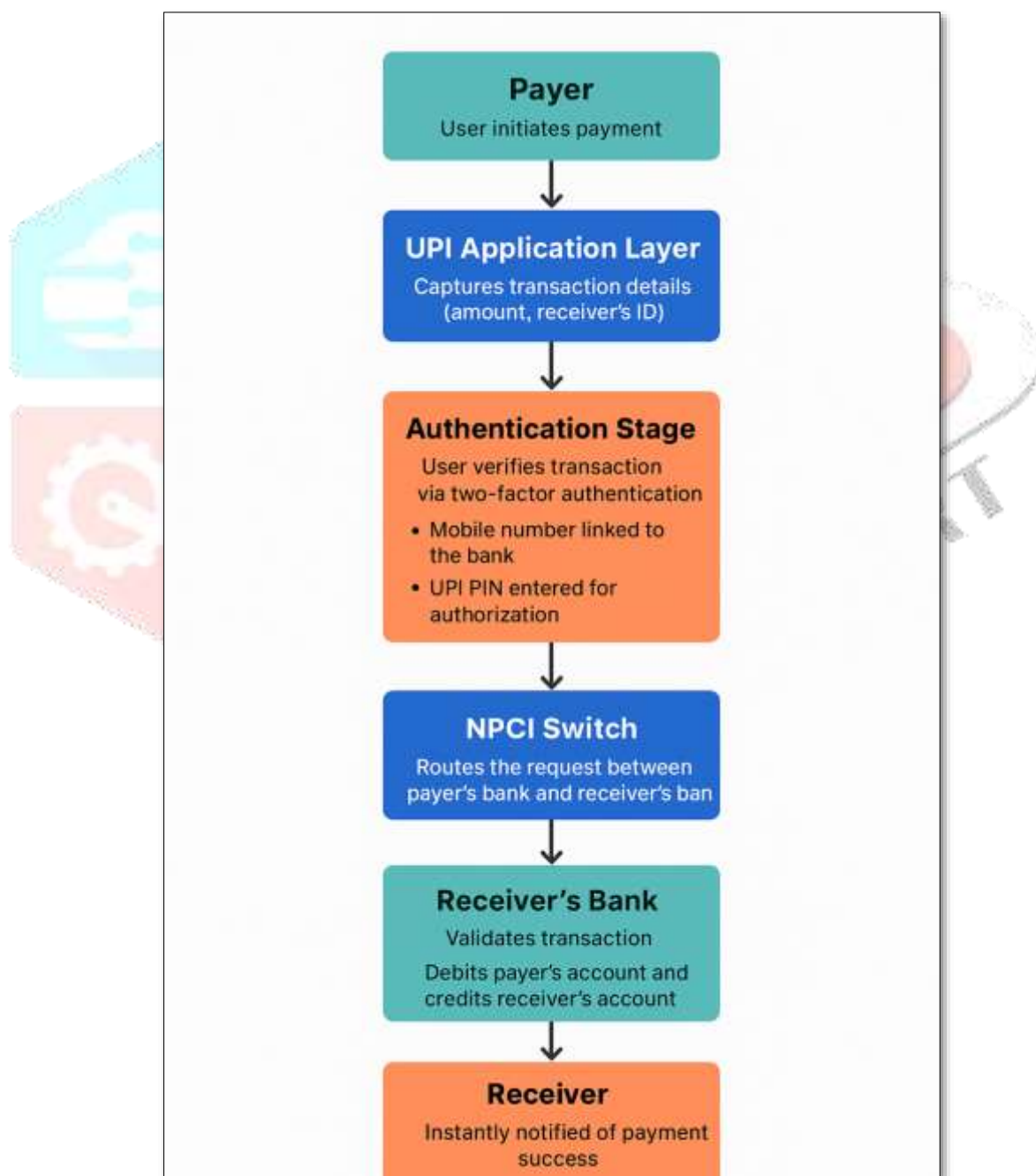
## 5. Settlement

- Funds are transferred directly from the payer's bank account to the receiver's bank account in **real time**, 24×7.
- Both payer and receiver receive instant confirmation notifications through their apps.

## 6. Additional Functionalities

- UPI also allows “Pull” requests (collect requests), recurring mandates, overdraft account linkage, and utility bill payments via Bharat BillPay integration.

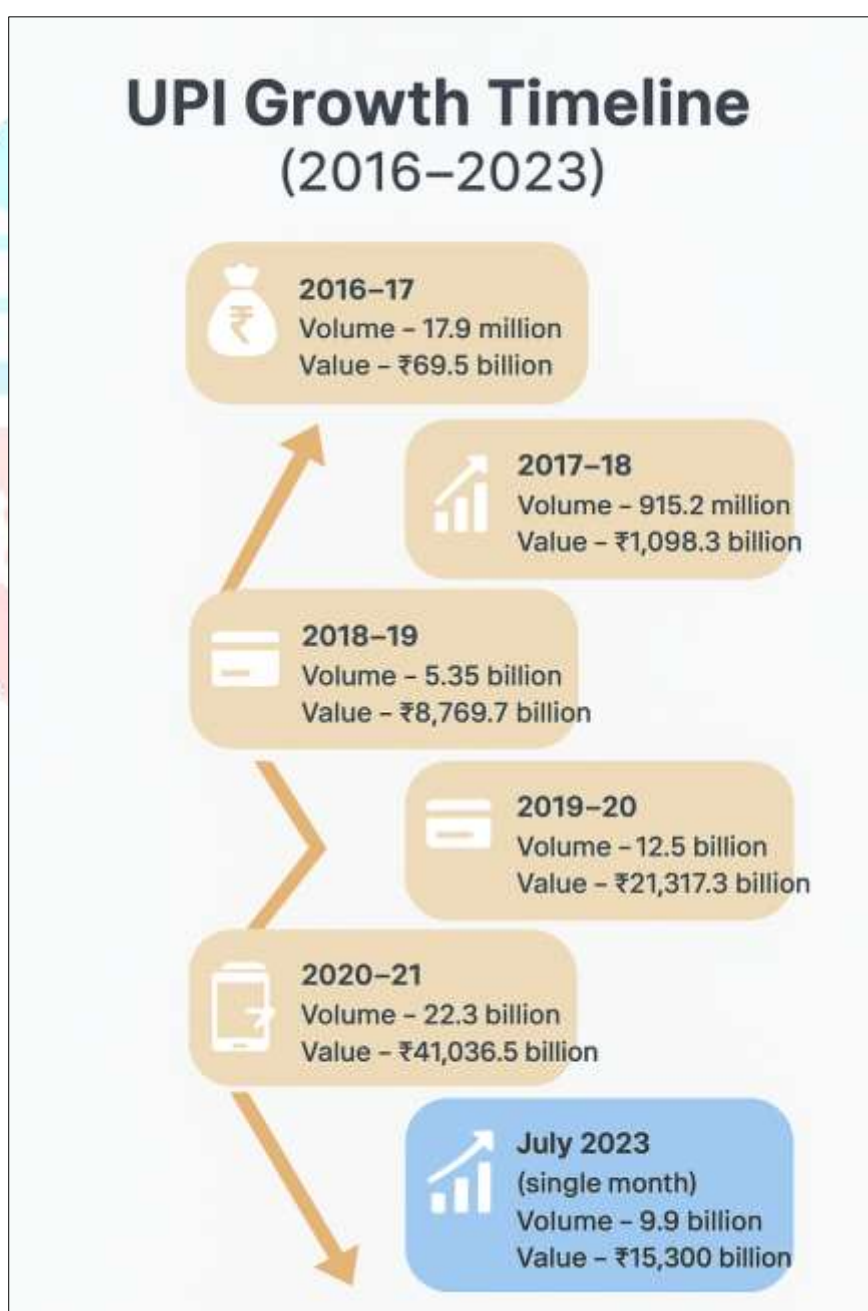
This streamlined process highlights why UPI has become the backbone of retail digital payments in India. Unlike earlier systems such as NEFT or RTGS, UPI offers **instant settlement, low transaction cost, and interoperability**, making it highly efficient for everyday transactions.



**Fig.1:** Flow chart for UPI Model



Since its launch in April 2016 by the National Payments Corporation of India (NPCI), the Unified Payments Interface (UPI) has demonstrated exponential growth in both transaction volume and value. In its first year (2016–17), UPI recorded just **17.9 million transactions**, valued at about **₹69.5 billion**, reflecting its nascent stage. By 2018–19, the volume surged to **5.35 billion transactions**, worth **₹8.7 trillion**, showing a rapid rise in adoption driven by smartphone penetration and government initiatives such as *Digital India* and demonetization. In 2019–20, UPI transactions more than doubled to **12.5 billion** with a value of **₹21.3 trillion**, while in 2020–21, it crossed **22.3 billion transactions** valued at **₹41 trillion**, partly accelerated by the COVID-19 pandemic's demand for contactless payments. As of **July 2023**, UPI processed more than **9.9 billion transactions in a single month**, valued at over **₹15.3 trillion**, marking it as the dominant mode of retail digital payments in India. This trajectory highlights UPI's role as the backbone of India's cash-lite economy, transforming everyday transactions for individuals, businesses, and governments alike.



**Fig.2: UPI growth from 2016 to 2023**



### VIII. Retail Payment:

Retail payment refers to small-value financial transactions carried out between individuals, consumers, and businesses for everyday goods and services. Unlike wholesale payments, which typically involve large-value interbank settlements, retail payments are characterized by their high frequency and lower value per transaction. These payments can be made using various instruments such as cash, cheques, debit and credit cards, prepaid wallets, mobile banking applications, and increasingly through digital platforms like the Unified Payments Interface (UPI). Retail payment systems are essential for driving financial inclusion and supporting economic activity, as they enable quick, secure, and convenient transfer of money at the consumer level. According to the **Reserve Bank of India (RBI)**, retail payments form the backbone of India's digital economy, accounting for a majority share of daily transactions across sectors such as groceries, utilities, e-commerce, transport, and bill payments. With the rise of digital technology, retail payments have shifted from cash-dominated methods to electronic and mobile-based systems, enhancing both efficiency and transparency in the economy.

### IX. Position of INDIA in Digital Payment Environment:

India today holds a leading position in the global digital payment landscape, driven by rapid technological adoption, policy support, and innovations such as the Unified Payments Interface (UPI). As per the **Reserve Bank of India (RBI)**, digital transactions in India have grown at a compound annual growth rate (CAGR) of over **50% in volume between 2016 and 2022**, reflecting a structural shift toward cashless payments. UPI has been the key catalyst, processing more than **83 billion transactions worth ₹139 trillion in FY 2022–23**, and crossing **10 billion transactions in a single month by August 2023**, a scale unmatched globally. According to **ACI Worldwide's 2022 report**, India accounts for nearly **46% of global real-time digital payment transactions**, far ahead of China, Brazil, and the United States. This remarkable growth has been supported by government initiatives like *Digital India*, Aadhaar-enabled payments, and the Pradhan Mantri Jan Dhan Yojana (PMJDY), which expanded financial inclusion by opening millions of new bank accounts. With increasing smartphone penetration, low-cost internet, and regulatory incentives such as zero Merchant Discount Rate (MDR) on UPI, India has not only achieved mass adoption but has also set a global benchmark for innovation in the digital payment ecosystem. India has emerged as a global leader in digital payments, primarily driven by innovations such as the Unified Payments Interface (UPI). According to the **Reserve Bank of India (RBI)** and the **National Payments Corporation of India (NPCI)**, UPI alone processed over **83 billion transactions worth ₹139 trillion in FY 2022–23**, making it the most widely used retail payment system in the country. Globally, India's contribution is unparalleled: as per data from **ACI Worldwide and Worldline (2022)**, India accounted for **46% of all real-time payment transactions worldwide**, surpassing countries like China, Brazil, and South Korea. By July 2023, India processed nearly **10 billion UPI transactions in a single month**, a milestone unmatched by any other economy. Moreover, the **World Bank's Global Findex Report (2021)** highlights that over **80% of Indian adults now have access to a bank account**, largely due to digital payment initiatives and Aadhaar-enabled systems. This rapid adoption reflects the success of the *Digital India* initiative and the growing penetration of smartphones and affordable internet. India's digital payment environment is not only the fastest growing

but also among the most inclusive, bridging gaps between urban and rural populations. This dominant position underscores India's transition toward a cash-lite economy and sets a benchmark for other developing nations striving for financial inclusion through digital transformation.

## X. SWOT analysis of UPI:

The SWOT analysis of the Unified Payments Interface (UPI) evaluates its internal strengths and weaknesses, along with the external opportunities and threats shaping its growth. UPI's **strengths** lie in its simplicity, interoperability, and real-time transaction capabilities, which have made it the backbone of India's digital payment ecosystem. Its low-cost structure, secure authentication, and ability to promote financial inclusion by enabling even small merchants and rural users to accept digital payments are major advantages. However, UPI also has **weaknesses**, including frequent transaction failures due to technical glitches, a transaction limit of ₹2,00,000 that restricts large-value transfers, limited digital literacy in rural areas, and inadequate grievance redressal mechanisms. On the external side, UPI has significant **opportunities**, such as expanding to semi-urban and rural regions with rising smartphone penetration, integrating with international payment systems, and diversifying services through UPI 2.0 and future upgrades. Strong policy backing from the Government of India and the Reserve Bank of India further enhances its potential. At the same time, UPI faces **threats** from persistent reliance on cash in India's informal economy, growing cybersecurity risks, competition from global fintech platforms and digital wallets, and the possibility of reintroducing charges or taxes on transactions that may reduce adoption. Overall, the SWOT analysis highlights that UPI is a powerful enabler of India's cash-lite economy, but requires continuous innovation, awareness campaigns, and stronger security measures to sustain its leadership in digital payments.

- **Strength**

- Simplified Payment Mechanism
- Instant, 24×7 fund transfers with simple Virtual Payment Address (VPA).
- Interoperable across banks and apps.
- Cost-effective with zero MDR charges for merchants.
- Enhances **financial inclusion**, enabling small vendors & rural users.
- Secure with two-factor authentication and PIN.
- Caters to Bottom of the Pyramid
- Multiple payment options with proper address
- Corruption Deterrent
- Secure sensitive information
- Notified of Future Payment
- Open usage

- **Weaknesses**

- Transaction cap of ₹2,00,000 limits high-value use.
- Frequent technical glitches and payment failures.
- Low awareness and adoption in rural areas.
- Weak grievance redressal system.
- Vulnerability to phishing and frauds.
- Delayed Transaction
- Irritation on Double verification
- Cybercrimes

- **Opportunities**

- Expanding Smartphone and internet penetration in semi-urban & rural India.
- Integration with global payment systems for cross-border use.
- Strong Banking Network
- Growth in Retail Digital Payment
- Internet Penetration
- Widening the scope of services
- Zero Merchant Discount Rate (MDR)
- UPI 2.0 features like overdraft accounts, recurring mandates, bill payments.
- Policy support from *Digital India* and RBI's cash-lite economy vision.

- **Threats**

- Continued dominance of cash in India's informal economy.
- Cyber security risks and rising online frauds.
- **Awareness**
- **Grievance redressal**
- Strong competition from fintech wallets and global payment players.
- **Tax on UPI service**
- Risk of taxation or MDR reintroduction reducing merchant adoption.



**Fig.3:** SWOT analysis of UPI

## XI. Finding and Conclusion:

The study reveals that India has emerged as a global leader in digital payments, with UPI serving as the central driver of this transformation. Findings indicate that UPI's simple design, interoperability, and cost-effectiveness have significantly enhanced financial inclusion by enabling both urban consumers and rural merchants to participate in the digital economy. To sustain and strengthen the growth of UPI in India's digital payment ecosystem, several measures are recommended. First, there is a need to enhance **technological infrastructure** to reduce transaction failures and improve system reliability during peak usage. Second, strengthening **cybersecurity mechanisms** through advanced fraud detection, biometric authentication, and AI-driven monitoring can boost consumer trust. Third, focused **awareness and digital literacy programs** in rural and semi-urban areas are essential to widen the user base and bridge the digital divide. In addition, expanding **cross-border UPI integration** will allow India to position its payment innovation on a global platform, benefiting international trade and remittances. Policymakers should also ensure that regulatory frameworks continue to support zero-cost transactions for merchants, while providing incentives for fintech innovations around UPI 2.0 and beyond. Looking ahead, UPI has the potential to evolve beyond payments into a **comprehensive financial services platform**, integrating credit, insurance, and investments. With sustained policy support, security upgrades, and global expansion, UPI can remain a cornerstone of India's digital economy and serve as a model for inclusive financial transformation worldwide. Statistical evidence shows exponential growth in transaction volumes and values since its inception, positioning India as the world's largest market for real-time payments. However, challenges such



as transaction failures, cyber security threats, and limited rural awareness remain critical concerns. The conclusion drawn from the analysis emphasizes that while UPI has successfully reshaped India's payment ecosystem, continuous technological innovation, stronger security frameworks, and targeted awareness campaigns are necessary to sustain its momentum. Overall, UPI is not only a benchmark for India's digital economy but also a model that can inspire similar initiatives globally.

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