Research Article

Unified Payments Interface (UPI): Trends and Growth in India's Digital Economy

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ABSTRACT

The Unified Payments Interface (UPI) has emerged as a major component of India's digital payment ecosystem, with substantial growth in transaction volume, transaction value and participating banks since its introduction. Although previous studies have examined the expansion, adoption and ecosystem of UPI, there is scope for an updated longitudinal assessment of its growth pattern and the association between bank participation and UPI transaction activity over an extended period. Against this background, the present study examines the trends and growth of UPI in India during the financial years 2016–17 to 2025–26 and analyses the association between participating banks and UPI transaction activity. The study is based on secondary data compiled from the National Payments Corporation of India (NPCI) and other relevant published sources. Descriptive statistics, year-wise trend analysis, annual growth rate (AGR), compound annual growth rate (CAGR), and Pearson correlation are employed to analyse the data. The findings indicate a substantial increase in UPI transaction volume and value over the study period, accompanied by a considerable expansion in the number of participating banks. The correlation analysis indicates a strong positive association between bank participation and both UPI transaction volume and transaction value. The study also identifies challenges related to digital literacy, digital infrastructure, cybersecurity, merchant awareness, and data privacy. The findings highlight the continued expansion of UPI and the importance of strengthening digital infrastructure, financial literacy, and payment security to support inclusive digital payment growth in India.

Keywords: Unified Payments Interface (UPI), Digital Payments, Digital Economy, NPCI, Transaction Volume, Transaction Value, Participating Banks.

INTRODUCTION

India's economy is evolving. Digitalization is a major component in India's economy, particularly in the finance and payment sectors. Digital India, launched in 2015, is an initiative by the Indian government for promoting digital transactions in the country. It aims to strengthen the digital infrastructure, promote digital empowered economy, and improve access to digital credit. There are significant changes in the conduct of financial transactions by individuals, businesses, and institutions due to the introduction of digital payment systems.

The Unified Payments Interface (UPI) has emerged as one of the major components of India's digital payment ecosystem, developed by the National Payments Corporation of India (NPCI). Individuals

and businesses can perform convenient digital payments; UPI enables real-time bank-to-bank transactions through a unified platform. Increasing participation of banks and payment-service providers, wider merchant acceptance, growing access to smartphones and internet services, and the increase in the use of digital financial services support UPI's expansion.

Both the transaction volume and transaction value substantially increased after the introduction of UPI. The cashless and electronic payment mechanism got attention during demonetization and the wider policy emphasis on digital payments. The growth of UPI can be attributed to many factors. Factors like changes in consumer payment behavior, increasing smartphone penetration, internet accessibility, merchant acceptance, etc., have also contributed to the expansion of UPI.

The growth of UPI has attracted significant academic attention. The existing studies have already examined the development of the UPI ecosystem, its role in digital payment expansion, factors associated with its adoption, and its implications for financial inclusion and the digital economy. However, the existing literature does not provide a sufficiently integrated and updated longitudinal examination of UPI transaction volume, transaction value, and participating banks over the extended period from 2016–17 to 2025–26. Further, the relationship between the expansion of participating banks and UPI transaction activity requires additional empirical examination using the latest available data.

Against this background, the present study analyses the trends and growth of UPI in India during 2016–17 to 2025–26. It examines transaction volume, transaction value, and participating banks using published secondary data and further analyses the association between bank participation and UPI transaction activity. The study also considers the major challenges associated with the continued expansion of UPI in India.

Accordingly, the objectives of the study are: (1) To examine the trends and growth of Unified Payment Interface in India's digital economy, (2) To examine the association between the number of participating banks and UPI transaction volume/value, and (3) to identify the challenges connected to the Unified Payment Interface.

LITERATURE REVIEW

Studies on UPI and Digital Payment Expansion

Badak, Kotte, Agarwal and Gupta (2023) have examined the revolution of digital payment in India. They focused on the factors responsible for its rapid expansion. The study is based on secondary data and used descriptive techniques to examine digital payment developments. The study identified UPI as a leading digital payment platform and reported a tremendous increase in digital payments after 2016. They identified factors such as Digital India, demonetization, expansion of internet access, and the Covid-19 accelerated the expansion of digital payments. The study also highlights cyber security threats and concerns regarding transaction security as important challenges to the user's confidence.

Mahesh and Ganesh Bhat (2021) have studied the expansion and development of UPI in India's digital payment ecosystem. The study is based on secondary data and uses an exploratory research design. It uses SWOT analysis to assess the strengths, weaknesses, opportunities, and threats associated with UPI. The study reported that there is a substantial expansion in the retail digital payment sector. They identified factors such as increasing smartphone usage, improved internet connectivity, and growing preference for contactless transactions. They identified strengths of UPI as simplicity, security, and cost-effectiveness, while threats include cybersecurity risks, technological challenges, and limited accessibility among people who do not have a bank account and are illiterate.

Cornelli, Frost, Gambacorta, Sinha and Townsend (2024) analyzed the organizational structure and development of India's digital payment ecosystem, with particular emphasis on UPI. Using secondary information and institutional evidence, the study examined the evolution, governance, and operational framework of UPI. The authors highlighted the importance of UPI's open architecture, interoperability, user-friendly interface, and zero-cost transactions in supporting its widespread adoption. The study also emphasized the role of regulatory support from the Reserve Bank of India (RBI) and the National Payments Corporation of India (NPCI), together with data protection and private-sector participation, in strengthening the efficiency and confidence of the UPI ecosystem.

Vijay Kumar and Unnisa (2024) Give Emphasis on transaction growth and factors contributing to UPI's success and its role in India's digital economy. The study is based on secondary data from NPCI reports, and they used a descriptive and analytical research design. The authors employed correlation analysis to examine the relationship between internet users and data usage trends. The study shows growth in UPI transactions and identifies increasing internet penetration, affordable data services, and smartphone adoption as important factors associated with the expansion of UPI. The findings indicate a vital and significant association between internet users and data usage trends.

Taken together, these studies examine UPI growth from different perspectives. Badak et al. (2023) primarily focused on the broader expansion of digital payments and the factors and challenges associated with this development, whereas Mahesh and Ganesh Bhat (2021) evaluated UPI through an exploratory and SWOT-based approach. Cornelli et al. (2024) concentrated more on the institutional and organizational structure of the UPI ecosystem, while Vijay Kumar and Unnisa (2024) examined transaction growth in relation to digital connectivity indicators. Thus, the existing literature demonstrates that UPI expansion is associated with technological development, digital connectivity, institutional support, and changes in payment practices.

However, the studies differ considerably in their analytical approaches, ranging from descriptive and exploratory analysis to institutional analysis and correlation analysis. This indicates the need for further longitudinal analysis combining

UPI transaction volume, transaction value, and participating-bank trends over an extended period.

Studies on UPI Adoption and Financial Inclusion

Arif, Hanif and Mishra (2026) investigated the penetration of UPI and its influence on financial behavior and inclusive economic development in India. The study was quantitative in nature and primarily relied on secondary data obtained from NPCI and RBI. Trend analysis, correlation, and regression techniques were employed to examine the development and implications of UPI. The study found considerable growth in UPI transactions and improvement in merchant adoption. It further indicated that increasing UPI usage was associated with changes in consumer financial behavior, including more frequent low-value digital transactions, reduced dependence on cash, and greater participation in the formal financial system. The authors concluded that the expansion of UPI has an important role in strengthening the digital payment ecosystem and supporting financial inclusion and inclusive economic development.

The literature also indicates that the expansion of UPI does not automatically ensure equal access to digital payment services. Mahesh and Ganesh Bhat (2021) identified limited accessibility among unbanked populations as one of the challenges affecting wider UPI adoption, while Badak et al. (2023) highlighted security-related concerns that may influence users' confidence in digital payments. These observations suggest that UPI adoption needs to be considered not only in terms of transaction growth but also in relation to accessibility, digital capability, security, and inclusion.

Although previous studies have examined various dimensions of UPI, including its expansion, adoption, ecosystem development, and relationship with broader digital-payment indicators, there remains scope for an updated longitudinal analysis covering the period from 2016–17 to 2025–26. In particular, limited attention has been given to examining the simultaneous trends in transaction volume, transaction value, and participating banks over this extended period and to statistically examining the association between bank participation and UPI transaction activity. The present study seeks to address this gap by analysing these dimensions using updated NPCI data.

METHODS

The study is descriptive and analytical in nature. The research aims to examine the growth and trend of the Unified Payment Interface. The secondary data used in the study were gathered from published sources such as RBI, NPCI, Ministry of Finance, GOI research articles, journal books, and official publications.

Period of Study

The study covers the period from 2016 to 2026 to evaluate the growth and trend of the UPI system.

Data Aggregation and Annualization

The monthly data on UPI transactions and related indicators from 2016-2026 consist of 120 observations. These monthly observations were aggregated to 10 financial-year observations corresponding to 2016-2017 to 2025-2026 for the year-wise analysis. The original monthly

dataset (120 observations) was converted into an annual dataset (10 financial-year observations).

Tools and Techniques

Secondary data are analysed using IBM SPSS, employing descriptive statistics, trend analysis for 2016–2026, annual growth rates for ten financial years, Compound Annual Growth Rate (CAGR), and overall growth analysis to assess the growth and development of UPI during the study period.

RESULTS

Growth of UPI transaction volume and participation of banks (2016-17 to 2025-26)

Table 1 shows the growth of UPI transactions, volume, value, and the number of banks participating in the UPI system from 2016-17 to 2025-26. Transaction volume was 17.86 million in FY 2016-17 and increased to 2,41,616 million in 2025-26. It shows rapid adoption and dissemination of the UPI system in the country.

During the year 2016-17, the transaction volume was rupees 6,952.14 crore, and it rapidly increased to rupees 31423249.71 crore in 2025-26. Covid 19 is one of the prime factors in increasing the growth of the UPI system, followed by other factors such as internet penetration, smartphone usage, and digital awareness, etc.

The number of banks that participated in the UPI payment network has also increased from 21 to 668, due to the rapid growth of the digital economy. Overall, the study period shows UPI has emerged as India's leading digital payment system, experiencing stable and sustainable growth throughout the study period.

Table 1*: Year-wise Growth of UPI Transaction Volume, Value and Participating Banks (2016–17 to 2025–26)*

Financial Year	Transaction Volume (Million)	Transaction Value (₹ Crore)	Number of Banks
2016–17	17.86	6,952.14	21
2017–18	915.22	109,831.80	48
2018–19	5,391.52	876,970.72	97
2019–20	12,518.61	2,131,730.14	141
2020–21	22,330.65	4,103,653.58	153
2021–22	45,967.53	8,417,572.48	220
2022–23	83,751.14	13,920,676.35	316
2023–24	131,129.83	19,995,085.51	414
2024–25	185,866.02	26,056,954.65	583
2025–26	241,616.88	31,423,249.71	668

Source: *Compiled from NPCI data*

Monthly Analysis of UPI Transactions from 2016-17 to 2025-26

Table 2 shows the descriptive statistics of 120 monthly observations of UPI transactions based on the data extracted from the NPCI. The number of banks participating in UPI transactions ranged from 21 to 705, with a mean (average value) of 296.88 banks. The SD is 225.20, indicating that the increase in the number

of banks over the study period ranges from 2016 to 2026, reveals the widespread adoption of the UPI system. The transaction volume and transaction value both show higher standard deviation. It shows that there is a significant expansion of monthly transaction volume and value, due to the rapid growth of UPI usage over the range of 2016 to 2026. All three variables show a strong upward trend over the 10 years and also indicate the rapid expansion of India's digital payment economy.

Table 2: *Descriptive Statistics*

Variables	N	Minimum	Maximum	Mean	Standard Deviation
Number of Banks	120	21	705	296.88	225.20
Transaction Volume (Million)	120	0	22,641	6,079.21	6,890.97
Transaction Value (₹ Crore)	120	0	2,952,542	892,022.31	926,685.19
Valid N (Listwise)	**120**	–	–	–	–

Source: *Computed from secondary data using SPSS*

Analysis Of Growth in Volume Over the Years

Figure 1 shows the growth of UPI transaction volume from the period 2016-17 to 2025-26. From the above graphical illustration, it is clear that the volume of UPI has shown an increasing trend without any decline.

The UPI system was introduced in 2016, so the transaction volume during the financial year 2016-17 was zero. In 2017-18, the UPI transaction volume was gradually raised to 146 million, followed by 189 million in 2018-19. The growth in volume is much faster after 2020s

In 2016-17, UPI transaction volume was zero because as UPI just has been introduced (2016). In 2017-18, it gradually increased to 146 million, followed by 189 million in 2018-19. The growth of transaction volume became faster after 2020.

In 2021-22, the UPI transaction volume increased to 2641 million, and then it increased to 7535 million in 2023-24. UPI transactions witnessed tremendous growth in the past two years. In the last year, 2025-26, the volume reached 20,701 million. In short, the UPI transaction volume shows an upward trend because of the continuous and fastest growth of the UPI system in India.

Annual Growth Rate - AGR

Table 3 presents the Annual Growth Rate (AGR) of UPI transactions from the period of time 2016-17 to 2025-26. So, 2016-17 is the base year; no AGR calculation for that year. The highest AGR was 5,024.41% in the year 2017-18, as UPI found a low base in the digital economy. It declined to 132.19% in 2019-20, and it further declined to 78.38% in 2020-21. But there is a gradual increase in 2021-22 to 105.85%, indicating renewed acceleration in UPI adoption.

Thereafter, in 2023-24, it is 41.74%, and 30% in 2025-26. So, the annual growth rate shows a declining trend. As the transaction volume and the value increase over the study period, the AGR tends to decline. Although the AGR decreases over

the time period does not mean a decrease in UPI adoption.

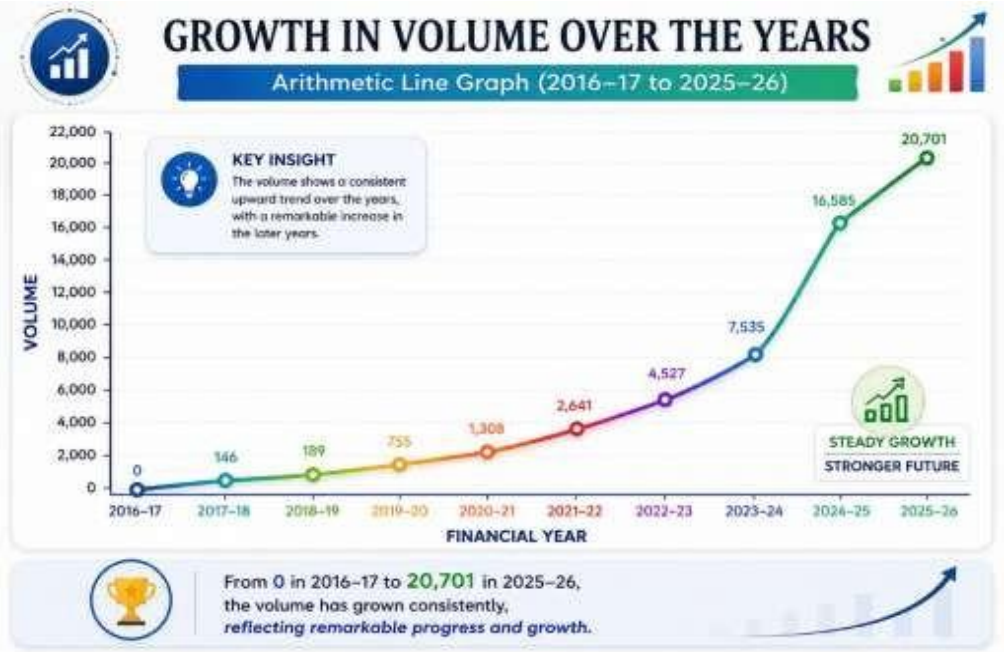


Figure 1: *Growth In Volume Over the Years*

Source: *Secondary Data from NPCI*

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Table 3: *Annual Growth Rate (AGR) of UPI Transaction Volume (2016–17 to 2025–26)*

Financial Year	Annual Growth Rate (AGR %)
2016–17	–
2017–18	5,024.41
2018–19	489.10
2019–20	132.19
2020–21	78.38
2021–22	105.85
2022–23	82.20
2023–24	56.57
2024–25	41.74
2025–26	30.00

Source: *Calculated by the Researcher Using NPCI Data.*

The annual percentage growth rate (CAGR) is approximately 187.8%. The exceptionally high CAGR should be interpreted with caution because the calculation begins from a very small initial base in 2016–17. Thus, the result primarily reflects the enormous expansion of UPI transaction volume over the study period and should not be interpreted as implying that UPI transactions increased by exactly 187.8 per cent in every individual year. The year-wise AGR provides a more appropriate measure of annual fluctuations in the pace of UPI growth

Formula Used:

$$\boldsymbol{AGR} = \frac{\text{Current Year Value} - \text{Previous Year value}}{\text{Previous Year Values}} * 100$$

CAGR- Compound Annual Growth Rate

Equation:

$$CAGR = \left(\frac{Ending\ Value}{Beginning\ Value} \right)^{\frac{1}{n}} - 1$$

Where:

Starting Value (2016–17) = **17.86**
Ending Value (2025–26) = **241616.88**
n = 9 (there are 9 growth intervals between 10 financial years)

Calculation

$$\text{CAGR} = \left(\frac{241616.88}{17.86}\right)^{\frac{1}{9}} - 1$$

$$= (13528.38)^{1/9} - 1$$

$$= 2.878 - 1 = 1.878$$

CAGR

$$\boxed{\text{CAGR} \approx 187.8\% \text{ per year}}$$

Correlational Analysis

Table 4 indicates a strong, significant association (positive relationship) between the number of banks and the value and volume of UPI transactions. Here, the p-value is 0.000; both the relationship is statistically significant. This shows that as the number of banks increases, both the value and volume of transactions increase significantly.

However, the correlation is based on only ten annual observations. The finding therefore provides useful descriptive evidence on the relationship between bank

participation and UPI growth, but should not be interpreted as conclusive causal evidence. More robust evidence on the underlying relationship may be provided by future studies with a larger number of observations and appropriate time-series techniques.

Table 4*: Correlation between Number of Banks, Transaction Volume and Transaction Value*

Variables	Number of Banks (r)	p-value	Result
Transaction Volume	0.991**	0.000	Strong positive correlation
Transaction Value	0.994**	0.000	Strong positive correlation

Note. *Correlation is significant at the 0.01 level (2-tailed). N = 10*
Source: *Secondary Data*

Bane of UPI Systems

- Digital gap between the rural and semi- urban areas. Bridge the digital gap for the effective adoption of UPI systems.
- Lack of internet connectivity and digital infrastructure in remote areas.
- Cyber frauds, fraudulent messages, and online payment scams are a major challenge to the secure use of UPI
- Small-scale merchants with limited technical knowledge face difficulties in adopting and using the UPI system.
- Concerns regarding privacy of data and transaction security, and sometimes payment issues may reduce confidence in using digital payments.

FINDINGS

The findings of the study revealed a substantial increase in the Unified Payments Interface during the year 2016-2026**.** UPI transaction value increased from Rs. 6952.14 crore to 31,423,249.71 crore, and the UPI transaction volume increased significantly from 17.86 million transactions in 2016-17 to 24,616.88 million transactions in 2025-26, showing the greatest booming of India's digital economy. Both transaction value and volume increase over the period of study, indicating the importance and UPI become a major part of digital India. The annual growth rate shows a declining trend; however, it does not mean a decline in transaction value or volume. The descriptive analysis further shows an overall increasing trend in the number of banks, UPI transaction volume, and UPI transaction value throughout the study period from 2016-17 to 2025-26. A Pearson correlation analysis reveals that there is a strong positive association between the number of banks and the UPI transaction volume, with caution, because the correlation is based on only ten annual observations.

Practical Implications

Based on the findings of the study, several measures can be adopted for the promotion of UPI payments in India. Firstly, conduct financial and digital literacy programmes, particularly in rural and semi-urban areas. Secondly, encourage greater participation of banks in order to improve the accessibility and effective use of UPI services across different regions. Third, strengthen the digital infrastructure, especially in areas with low connectivity to ensure safe and

secure UPI services. Fourth, training and awareness programmes should be provided to the small and micro merchants in order to understand the UPI services and enable them to adopt them in their businesses. Finally, cyber security should be improved to prevent cyber frauds and protect the data of various users. All these measures contribute to a more safe, secure, accessible, and inclusive growth in UPI services and development in India's digital economy.

CONCLUSION

The present study concludes that in India's digital payment environment, the Unified Payments Interface (UPI) has become a revolutionary force. by enabling fast, convenient, and secure financial transactions. The data from 2016 to 2026 shows that there is a rapid increase in the number of participating banks, transaction volume, and transaction value. This growth shows the transformation of Indian economy into digital economy.

Despite the remarkable growth in India's digital economy, there exist several challenges or limitations. Digital gap between rural and semi-urban areas, lack of internet connectivity, lack of digital literacy, and lack of awareness about the adoption and usage of the UPI system, etc are major limitations faced by India's digital economy.

Overall, the study suggested that creating campaigns for improving digital literacy and inclusive banking services is very essential to overcome the urban-rural digital gap. It will not only help us to the enhancement of UPI adoption, but also contribute to an inclusive, secure, and sustainable digital payment ecosystem in India.

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Artificial Intelligence (AI) Usage Disclosure

The authors declare that generative artificial intelligence (AI) tools were used only to assist with language editing, grammar improvement, and manuscript formatting where necessary. All research activities, including study design, data collection, statistical analysis, interpretation of results, and scientific conclusions, were performed solely by the authors. The authors have carefully reviewed and take full responsibility for the accuracy, originality, and integrity of the submitted manuscript.