

The UPI Revolution: An Analysis of India's Rapidly Growing Online Transactions

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Abstract

This research paper analyses the Unified Payments Interface (UPI) revolution in India and its impact on the growth of online transactions. The UPI, introduced in 2016, has rapidly gained popularity, recording over 8.6 billion transactions, worth over INR 12.08 trillion in, March 2023.

The paper examines the factors driving UPI adoption, including convenience, history and development and integration with payment apps. It also explores the UPI's impact on India's economy, including financial inclusion during covid-19.

Despite its remarkable growth, the paper also highlights some limitations of UPI, such as limited internet connectivity, transaction limits, and security concerns. The UPI's growth trajectory remains impressive, and UPI is likely to continue driving the growth of online transactions in India in the years to come. This research highlights the significance of the UPI revolution and provides valuable insights for policymakers, businesses, and researchers in the field of digital payments.

Keywords

UPI, Digital Payments, Mobile Payments, Online Transactions, Financial Inclusion, Digital Economy, Mobile Apps, Payment Apps, COVID-19, Internet Penetration, Convenience, Cybersecurity, Financial Literacy, Merchant Acceptance, Policy Implications, Transaction Limits, Interoperability, Digital Infrastructure.

INTRODUCTION

In 2016, the National Payments Corporation of India (NPCI) manifested the Unified Payments Interface (UPI), an expeditious and current payment platform. By utilizing a solitary mobile application, UPI allows for convenient and swifter digital transactions between bank accounts. The utilization of digital payments has burgeoned in India since the implementation of the Digital India initiative post-demonetization. The Indian government instituted this venture to ensure a more unambiguous and prompt service for its citizens.

We choose to study one country India due to said move forward, there has been a vast proliferation in the use of mobile phones and internet, ultimately resulting in a surge in digital payments. The utilization of digital payments augments transparency in financial transactions which tangentially benefits the Indian economy. Transacting with the UPI has changed the game for people, companies, and vendors in India, transforming the payments scene. The UPI has been a game-changer in the Indian payments landscape, revolutionizing the way individuals, businesses, and merchants transact. [1]



Figure 1. UPI in India's digital payment landscape

Objectives

1. To understand the UPI and its features.
2. To analyse the factors driving UPI adoption, including convenience and integration with payment apps.
3. To explore the impact of UPI on India's economy and transparency.
4. To identify the challenges facing UPI, including cybersecurity and interoperability.
5. To explore the UPI app market space in India.

METHODOLOGY

The methodology section outlines the research approach used in the paper, including data collection and analysis methods. It discusses the sources of data used in the study, including secondary data from reports, publications, and online sources. The section also outlines the statistical techniques used to analyse the data, including regression analysis and trend analysis. [3]

The Methodology employed in this paper involves following steps:

1. **Data Collection:** Data was collected from various sources, including reports, publications, academic papers, and online platforms. The primary data sources include the Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), government publications, and reputable financial news outlets.

2. **Data Analysis:** The collected data was subjected to rigorous analysis using statistical techniques and regression analysis to examine trends, growth patterns, and relationships between UPI transactions, online transactions, and other

relevant variables. Trend analysis was utilized to understand the growth trajectory of UPI transactions over time.

3. **Interpretation and Results:** The analysed data was interpreted to draw meaningful conclusions and insights about the impact of UPI on India's digital payments ecosystem and its role in fostering financial inclusion.

4. **Policy implications:** The policy implications aimed to leverage the strengths of UPI and address the identified limitations to further enhance the digital payment ecosystem in India.

Overall, the methodology used in this research paper ensured a robust and evidence-based approach to explore the UPI revolution's significance and its impact on India's digital payment landscape. The combination of primary and secondary data sources, along with rigorous data analysis techniques, provided a comprehensive understanding of UPI's role in driving online transactions and its implications for policymakers and businesses in the digital era.

LITERATURE REVIEW

The literature review section provides an overview of the Unified Payments Interface (UPI) has revolutionized online transactions in India since its introduction in 2016. With over 8.6 billion transactions worth INR 12.08 trillion in March 2023 alone, UPI has quickly gained popularity. Convenience, integration with payment apps, and its development history are key factors driving its adoption. Moreover, UPI has played a significant role in promoting financial inclusion during the COVID-19 pandemic. It examines various payment systems available in India, including mobile wallets, credit cards, debit cards, and net banking. It also discusses the factors that led to the development of the UPI, including the need for a simpler and more convenient payment system. The section also highlights the key features of the UPI, including its interoperability and security.

The literature review reveals the transformative impact of UPI on India's digital payment ecosystem. The convenience, integration with popular payment apps, and historical development have driven its widespread adoption. UPI's role in promoting financial inclusion, especially during the COVID-19 pandemic, highlights its importance in fostering a cashless economy. However, challenges such as limited internet connectivity and cybersecurity concerns warrant attention to sustain its growth. The competitive landscape of UPI apps underscores the dynamic nature of the market. Overall, the literature reflects the significance of UPI and provides a foundation for further analysis in this research paper.

Unified Payments Interface (UPI)

Unified Payments Interface (UPI) is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing & merchant payments into one hood. It also caters to the "Peer to Peer" collect request which can be scheduled and paid as per requirement and convenience.

[4]

History and Development of UPI

In 2012, the Reserve Bank of India (RBI) put the concept of UPI. They requested the NPCI to design a mobile payment method that could function between various banks. The NPCI launched UPI in August 2016, with 21 banks onboard. Today, over 200 banks and payment service providers in India offer UPI services. UPI has undergone several updates and improvements since its launch, including the introduction of UPI 2.0 in 2018, which added new features like overdraft facility and invoice payments. [5]

Features of UPI

1. **Interoperability:** UPI is interoperable across banks, which means that users can send and receive money from any UPI-enabled bank account.

2. **Real-time payments:** UPI transactions are processed in real-time, which means that funds are transferred instantly between bank accounts.

3. **Multiple payment options:** UPI offers more than one payment alternatives, including person-to-person (P2P) transfers, bill payments, service provider bills and donations.

4. **Security:** UPI uses two-factor authentication (2FA) and multi-factor authentication (MFA) to ensure the security of transactions.

5. **Low transaction fees:** UPI transaction fees are low compared to other payment methods, making it an affordable option for users.

Growth of Online Transaction in India from 2016-2022

In recent years, India has risen to the forefront of digital payments, developing an ecosystem that facilitates the adoption and use of digital payments. Many nations are currently attempting to duplicate India's payment systems, specifically the Unified Payments Interface (UPI). [2]

As of May 2021, the platform has 100 million monthly energetic users in India. The percentage of UPI transactions in total quantity of digital transactions grew from 23% in 2018–19 to 55% in 2020–21 with a median value of ₹1,849 consistent with transaction. Digital transactions well worth ₹8.31 trillion were made via the platform in January 2022. In FY 2021–22, the cost of transactions crossed \$1 trillion.

As of March 2023, there had been 399 banks to be had at the platform with a monthly volume of 8.6 billion transactions amounting to ₹12.08 trillion (US\$149 billion). [6]

Growth Trends

```
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\UPI
Transactions India.csv")
df
```

Table 1. Table of UPI Transactions in India from 2016-2023

Month	No. of Banks live on UPI	Volume (in Mn)	Value (in Cr.)
0 Mar-23	399	8,685.30	14,10,443.01
1 Feb-23	390	7,534.76	12,35,846.62
2 Jan-23	385	8,036.89	12,98,726.62
3 Dec-22	382	7,829.49	12,82,055.01
4 Nov-22	376	7,309.45	11,90,593.39
...
79 Aug-16	21	0.09	3.09
80 Jul-16	21	0.09	0.38
81 Jun-16	21	0	0
82 May-16	21	0	0
83 Apr-16	21	0	0

84 rows x 4 columns

```
import matplotlib.pyplot as plt
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\UPI Transactions India.csv")
df['Month'] = pd.to_datetime(df['Month'], format='%m-%Y')
df_last_month = df.groupby(df['Month'].dt.year).tail(1)
years = df_last_month['Month'].dt.year.tolist()
transactions = df_last_month['Volume (in Mn)'].tolist()
plt.plot(years, transactions, marker='o')
plt.xlabel('Year')
plt.ylabel('Number of Transactions (in millions)')
plt.title('UPI Transaction Statistics (2016-2023)')
plt.show()
```

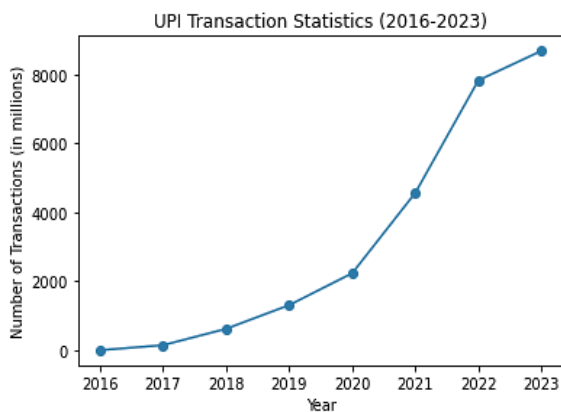


Figure 2. Graph showing UPI Transactions (in millions) in India from 2016-2023

Who dominates the UPI app market space in India



Figure 3. Image of UPI Apps

The UPI (Unified Payments Interface) app market in India is fiercely competitive, with several players vying for dominance. According to the latest statistics as of March 2023:

1. **PhonePe:** PhonePe, owned by Flipkart, currently holds the largest market share with 50% of all UPI transactions. PhonePe has been gaining popularity in recent years, thanks to its wide range of features and user-friendly design.

2. **Google Pay:** Google Pay which holds 34.2% of market. Google Pay's popularity can be attributed to its user-friendly interface, wide acceptance, and promotional campaigns.

3. **Paytm:** Paytm with a 10.8% market share. Paytm was one of the earliest entrants into the UPI app market, and its popularity soared in the aftermath of the demonetization drive in India. However, in recent years, it has faced stiff competition from other players, particularly Google Pay and PhonePe. [7]

4. **Amazon Pay:** Amazon Pay, which has gained traction in recent years owing to its integration with Amazon's e-commerce platform. Amazon Pay currently holds 3.5% of the market share.

5. **BHIM UPI:** the BHIM UPI app comes in fifth place with a 1.5% market share. BHIM turned into released via the Indian authorities in 2016 as a part of the Digital India campaign to promote cashless transactions. However, despite its early promise, it has struggled to gain significant market share in the face of competition from different players in market.

```
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\top_5_UPI_apps.csv")
df
```

Table 2. Table of Top 5 UPI Apps in India with their market share

	App Name	Volume (Mn)	Value (Cr)	Market Share(per)
0	PhonePe	3519.12	620121.97	50%
1	Google Pay	2639.55	424442.48	34.20%
2	Paytm Payments Bank App	1027.97	116864.36	10.80%
3	Amazon Pay	47.80	8981.82	3.50%
4	BHIM	23.21	7158.37	1.50%

```
import matplotlib.pyplot as plt
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\top_5_UPI_apps.csv")
players = df['App Name']
market_share = df['Market Share(per)']
plt.pie(market_share, labels=players, autopct='%1.1f%%')
plt.title('Market share of UPI app players')
plt.show()
```

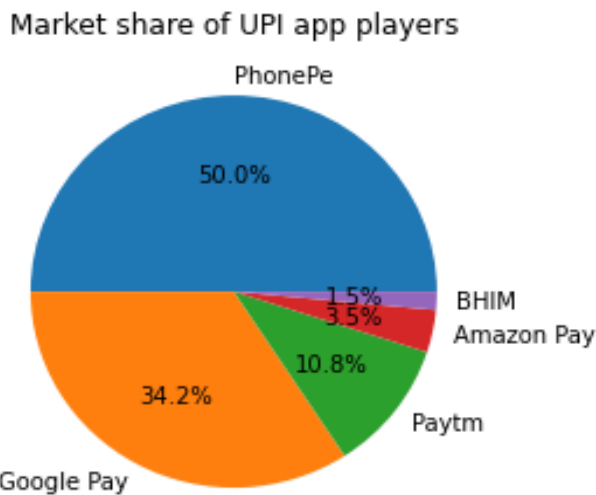


Figure 4: Pie showing market share of Top 5 UPI Apps

How UPI transactions nearly same debit & credit card transactions

As of 2021, UPI (Unified Payments Interface) transactions in India have grown significantly and have come close to matching the number of debit and credit card transactions. Acc. to the data released by the Reserve Bank of India (RBI), the UPI transactions recorded a total of 5.75 billion transactions in January 2021, while debit and credit card transactions recorded a total of 5.4 billion transactions during the same period.

This trend of UPI transactions catching up with debit and credit card transactions is not new. In fact, UPI transactions have been growing at an exponential rate over the past few years, while the growth rate of debit and credit card transactions has been relatively slow.

Overall, the trend of UPI transactions coming close to matching the number of debit and credit card transactions in India is a clear indication of the growing popularity of digital payments in the country. With the continued growth and innovation in the UPI app market, it is likely that UPI transactions will continue to grow and may even surpass debit and credit card transactions in the near future. [6]

```
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\UPI vs Others.csv")
df
```

Table 3. Table of payment methods of India with their transaction's percentage

	Payment Method	Percentage
0	UPI	50%
1	Debit Card	25.90%
2	Credit Card	17.20%
3	Mobile Wallets	6.90%

```
import matplotlib.pyplot as plt
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\UPI vs Others.csv")
payments= df['Payment Method']
percentage = df['Percentage']
plt.pie(percentage, labels=payments, autopct='%1.1f%%')
plt.title("Total Number of Transactions for UPI, Debit Cards, Credit Cards and Mobile Wallets ")
plt.show()
```

Total Number of Transactions for UPI, Debit Cards, Credit Cards and Mobile Wallets

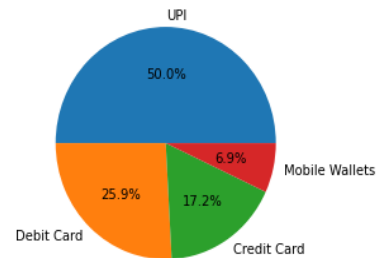


Figure 5. Pie chart showing payment methods of India with their transactions percentage

Huge Impact of covid 19

The COVID-19 pandemic has significantly impacted the way people in India conduct their financial transactions, including the usage of UPI (Unified Payments Interface). With the country going into lockdowns and social distancing becoming a norm, there has been a enormous growth in the adoption of digital payments, including UPI, as a means of contactless transactions. [6]

Overall, the COVID-19 pandemic had a huge impact on UPI transactions in India, leading to a massive surge in their usage and cementing their position as a popular mode of digital payment.

India's Digital Payments Triumph: Outpacing the World Amidst Covid-19

India has emerged as a leader in digital payments, outpacing the rest of the world in terms of adoption and transaction volume. The introduction of the Unified payments Interface (UPI) in 2016 has played a key role in riding the boom of digital payments in India. UPI is a real-time payment gadget that lets in customers to switch or transfer money instantly among financial institution debts via a mobile software.

According to a report by the World Payments Report, India's digital payment transactions grew by over 50% in 2020, outpacing the global average of 8.9%. The COVID-19 pandemic performed a good-sized position in using the growth of virtual payments in India, as consumers and businesses sought to minimize physical contact and reduce the risk of transmission of covid-19.

Overall, the growth in digital payments in India is a testament to the power of innovation and the potential for digital payments to transform the way we conduct financial

transactions. As more consumers and businesses embrace digital payments, it is likely that India will continue to lead the way in this space and inspire other countries to follow suit. [6]

```
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\Digital payments during covid-19.csv")
df
```

Table 4. Table showing Top countries having digital payments transactions during covid-19

	Country	Transactions (in billions)
0	India	25.5
1	China	15.7
2	South Korea	6.0
3	Thailand	5.2
4	Uk	2.8
5	Nigeria	1.9
6	Japan	1.7
7	Brazil	1.3
8	USA	1.2
9	Mexico	0.9

```
import matplotlib.pyplot as plt
import pandas as pd
df = pd.read_csv("C:\\Users\\91885\\Downloads\\Digital payments during covid-19.csv")
countries = df['Country']
transactions = df['Transactions (in billions)']
plt.bar(countries, transactions, color='Red')
plt.xlabel('Countries')
plt.ylabel('Digital Payment Transactions (in billions)')
plt.title('India\'s Growth in Digital Payments During COVID-19')
plt.xticks(rotation=90)
plt.show()
```

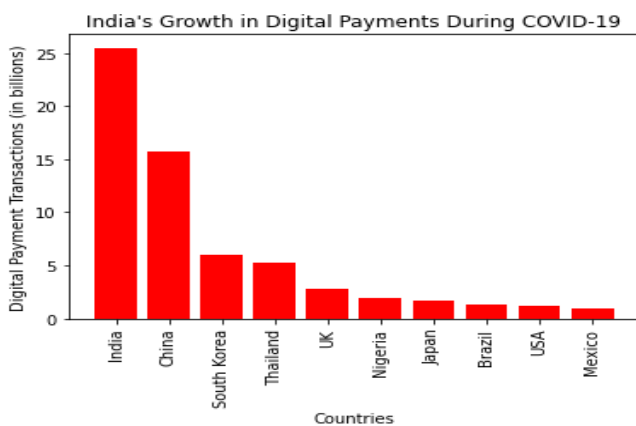


Figure 6. Graph showing Top countries having digital payments transactions during covid-19

CONCLUSION AND FUTURE SCOPE

In conclusion, the Unified Payments Interface (UPI) has brought about a transformative shift in the way Indians conduct digital transactions, offering simplicity, speed, and security. Its impact on financial inclusion and digitalization in India has been immense, paving the way for a future filled with promising prospects. As digital payments continue to flourish and new technologies are embraced, UPI is poised to play an even more pivotal.

Policy Implications

The success and continued growth of UPI provide valuable insights for policymakers, businesses, and researchers in the field of digital payments. To further strengthen the digital payment ecosystem and capitalize on the UPI revolution, the following policy implications are recommended:

1. **Promote Financial Literacy:** Policymakers should focus on enhancing financial literacy and awareness among the population, especially in rural and underserved areas. Educating individuals about the benefits and security measures of digital payments will boost confidence and encourage greater UPI adoption.
2. **Address Connectivity Gaps:** To ensure widespread UPI adoption, investments in digital infrastructure and internet connectivity must be prioritized, particularly in remote regions. Bridging the connectivity gap will unlock the full potential of UPI, facilitating financial inclusion and economic growth.
3. **Incentivize Merchant Acceptance:** Encouraging more merchants to accept UPI payments requires targeted incentives and streamlined onboarding processes. Policymakers can collaborate with industry stakeholders to promote UPI acceptance, reducing the reliance on cash transactions and driving the cashless economy.
4. **Strengthen Cybersecurity Measures:** As UPI transactions surge, policymakers and regulators must collaborate with banks and payment service providers to fortify cybersecurity measures. Robust security protocols and continuous monitoring will protect users from potential threats and build trust in the digital payment ecosystem.

Limitations of UPI

While UPI has revolutionized the way Indians make digital payments, there are still some limitations that need to be addressed. Some of the limitations of UPI in India are:

1. **Limited internet connectivity:** UPI relies heavily on internet connectivity, and in areas where internet connectivity is limited or unreliable, UPI transactions may not be possible.
2. **Limited acceptance:** While UPI is gaining acceptance among merchants, it is not yet accepted universally. This limits the number of transactions that can be made using UPI.
3. **Security concerns:** While UPI is considered a secure payment system, there have been instances of fraud and hacking. This highlights the need for continued vigilance and security measures.

4. **Transaction limits:** UPI has a transaction limit of INR 1 lakh (approximately \$1,350), which may be insufficient for larger transactions.

5. **Technical issues:** UPI transactions may fail due to technical issues, such as server downtime, which can cause inconvenience to users.

The future of UPI in India looks promising, with the continued growth of digital payments and the adoption of new technologies. Noteworthy advancements like UPI AutoPay and UPI QR have already enhanced its functionality, while upcoming developments such as UPI 3.0 with features like invoice payments and overdraft facilities promise further expansion. UPI's success has not only cemented its place in the Indian economy but has also inspired similar projects throughout the world. UPI will likely remain a driving force in influencing the future of digital commerce in India and worldwide with its continuing expansion and technical advances.

The UPI revolution has transformed India's digital payments landscape, offering speed, security, and financial inclusion. Policymakers, businesses, and researchers must collaborate to address the identified limitations and capitalize on the policy implications to sustain UPI's growth and ensure its continued role as a catalyst in India's digital economy. By nurturing UPI's potential and building on its success, India can solidify its position as a leader in the global digital payments arena, driving economic growth and empowering millions with access to seamless and secure financial transactions. [5]

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