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Emerging Trends in Digital Payments: A Study in India

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Abstract

The landscape of digital payments in India has evolved gradually since the banking industry was liberalised in the 1990s and new technology like Automated Teller Machines (ATMs) and Magnetic Ink Character Recognition (MICR) were introduced. Following that, various kinds of payment products and service providers were introduced in 2010 (wallets, recharge vouchers, stored value cards, etc.). Compared to many developed less-cash nations, India is seeing a faster development trajectory in digital payments. This paper focuses on the volume and value of electronic payments, as well as advancements in e-payments including RTGS, NEFT, UPI, and mobile banking transactions. It examines the trend and pattern of the volume and value of transactions of electronic payments and studies the developments in electronic payments such as Real Time Gross Settlement (RTGS), National Electronic Funds Transfer (NEFT), UPI transactions and Mobile Banking transactions. The findings of the study state that there is a significant difference in the mean transactions of RTGS, NEFT, UPI and Mobile Banking Transactions before and after Covid-19 in terms of 'volume' and 'value'.

***Key words**: RTGS, NEFT, UPI, mobile banking.*

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1. Introduction

India is one of the fastest growing countries in terms of usage of mobile phones as mobile phones are frequently being used as mobile services in addition to being a means of communication. As the number of incidents during Covid rose, the pandemic made people reconsider using cash; some switched to contactless transactions instead of cash. The psychological aspect of individuals viewing money as "unclean" may influence their preferred method of payment, even if the risk is not demonstrated. Mobile payments had not even approached adoption prior to the outbreak. During the pandemic, digital payments have become much more common. There are over 90 crore mobile users out of which 4 crore customers use digital or mobile transactions.

India assists other developing countries in developing comparable frameworks, as it is well-positioned to actively participate in information exchange. The pillars that will shape digital payments are integrity, innovation, inclusivity, internationalisation, and institutionalisation. Additionally, projects like the improvement in the FinTech Repository and cloud facility for the Indian Financial Sector will simplify operations, encourage innovations in finance and improve operational efficiency.

The UPI platform surpassed 13 billion transactions in a single month of March 2024 and marked important milestones. BBPS continued momentum by enabling more than 21,000 billers to pay and receive bills through a vast network statewide, which consists of 1272 digital and 92 lakh physical locations. The number of subscribers and newly linked accounts increased tenfold during 2023-24. Due to digitalisation, the financial sector has seen a significant transformation. The number of successful e-KYC authentications based on Aadhar rose by 28%.

There are several factors that are driving the growth of cashless payment systems. The first is the rapid growth in internet accessibility which is because of the people using mobile phones especially in developing countries. After growing by 58.3%, the number/ volume of digital payments grew by 44.3% in 2023-24. After growing by 19.7%, the total amount/ value of digital payments grew by 16.4%. E-commerce is growing as more people have access to the internet. Customers require paperless payment methods to perform transactions with other people and engage in online transactions with retailers. This paper is a modest attempt to investigate the trends in digital payments pre and post Covid-19.

2. Review of Literature

Khiaonarong (2000), in their research article titled "Electronic Payment Systems development in Thailand", attempted an examination of how Thailand became the home for the present electronic payment system. It was also determined that this innovation has helped in facilitating business expansion in several industries, including hospitality, banking and other services and payment activities.

Teoh et al. (2013) in their "Factors affecting consumers' perception of electronic payment: an empirical analysis" studied on electronic payments and the elements affecting consumer opinions. The findings stated that, with the expansion or spread of the e-banking services in Malaysia, the usage of e-payments is consistent and widely used. The results stated that the advantages, ease/convenience of usage and self-efficacy are the three highly influential factors from the viewpoint of consumers. Further, it has been found that there was no correlation between consumer perception of electronic payment and security or trust.

Rajput's (2015) study focused on the feelings of customers on online banking. An empirical investigation aimed at examining customers' perceptions of online banking. It discusses how consumers view online banking, its effects, and the marketing strategies employed by banks to advertise it. Therefore, this research investigates whether the quality of e-banking services offered has an impact on customers' selection of banks. This study discovered that the use of online banking is significantly influenced by income, gender, and educational attainment. Additionally, it was found that the research supported the conceptual framework, which argues that customers who can improve their skills will be more likely to use online banking.

Waithika et. al. (2015) in their study on "Customer Perception on Ease of Internet Banking in Commercial Banks in Kenya" focused on how internet banking usage in Kenyan commercial

banks is affected by customer perception. In this study, 1837312 commercial bank customers from Nairobi County were included. The participants were selected to represent the target population using stratified random sampling techniques. A descriptive study was done for this research. Based on the findings, it was found that online banking is influenced by customers' perception. Customers think that transactions and access fees are expensive for internet banking. It was also found that, due to the high cost of internet connection and high price of online banking activities, customers prevent the use of the internet and the technological solutions provided by the commercial banks. In their article "An Empirical Study on Consumer Adoption of Mobile Wallet with Special Reference to Chennai City," **Manikandan & Jayakodi (2017)** discovered that demonetization in India has led to a rise in mobile wallets and their usage. Aside from these considerations, the convenience and simplicity of use of mobile wallets contributed to their popularity. It was also concluded that the use of mobile wallets will rise sharply in the near future due to the growing number of smartphone users and the growth of the internet. An attempt was undertaken by Singh & Rana to comprehend how customers felt about digital payments. Their research revealed that the adoption of digital payments is greatly influenced by education. The survey also found that respondents' views on gender, age, profession, and annual income did not significantly differ from one another. The respondents noticed a significant difference just in the respondents' degree of education. It implies that the adoption of digital payments is affected by users' level of understanding.

Roy S. and Sinha I. (2017) in their study on "Factors affecting Customers' adoption of Electronic Payment: An Empirical Analysis", studied on perceived utility, ease of use, risk and security which are considered as the major indicators of customers intention to use electronic payments. According to his study, customers can create e-payment services that satisfy them by having an understanding on these adoption influencing elements.

Khan et al. (2024) in their study on, "Greening for greater good: investigating the critical factors for customer satisfaction with sustainable e-banking" found that efficiency, reliability, responsiveness, safety and security significantly impacted the customer satisfaction with e-banking services. Efficiency and reliability were the primary elements that impacted on customer satisfaction. The second and third factors that impact on customer satisfaction are safety, security and responsiveness. The study's conclusions have major consequences for the commercial banks as they show how important these elements are to the growth of e-banking procedures that are environmentally friendly. The findings of the study help those commercial banks that are looking to enhance their online banking offerings and customer satisfaction. In this competitive banking industry, commercial banks can show their competitiveness and improve their sustained growth by giving high priority to these elements like efficiency, reliability, responsiveness, safety and security.

3. Objectives

- To analyse the volume and value of transactions through Electronic Payments.
- To analyse trends in electronic payment transactions, including RTGS, NEFT, UPI and Mobile Banking

4. Hypothesis

H_{01}: The mean volume and value of RTGS transactions do not have a significant difference during the pre- and post-COVID-19 periods. $H_{01:}\ \mu1 = \mu2$

H_{02}: The mean volume and value of NEFT transactions do not have a significant difference during the pre- and post-COVID-19 periods. $H_{02:}\ \mu1 = \mu2$

H_{03}: The mean volume and value of UPI transactions do not have a significant difference during the pre- and post-COVID-19 periods. $H_{03:}\ \mu1 = \mu2$

H_{04}: The mean volume and value of Mobile Banking transactions do not have a significant difference during the pre- and post-COVID-19 periods. $H_{04:}\ \mu1 = \mu2$

5. Methodology

The secondary data is gathered from the websites of the National Payments Corporation of India (NPCI) and the Reserve Bank of India (RBI). Transactions

pertaining to payments between 2016–17 and 2023–24 is collected from RBI bulletin. With an objective of studying the test of significant difference before and after the pandemic, a paired t-test is applied.

6. Results and Analysis

6.1 Real-Time Gross Settlement (RTGS)

'RTGS' is a financial system where the fund transfer happens instantly in a real-time and on an individual transaction basis, without any netting. This mode of payment is used for high valued transactions that require immediate settlement. Once a transaction is settled, it cannot be reversed. Central Banks operate RTGS and it is considered a crucial component of the Global Financial Infrastructure

Table 1

Growth in RTGS Transactions (Volume and Value)

Year	Volume		Value	
	(Number in Million)	Growth (%)	(₹ in Billion)	Growth (%)
2016-17	107.8	-	981904	-
2017-18	124.4	15.40%	1167125	18.86%
2018-19	136.6	9.81%	1356882	16.26%
2019-20	150.7	10.32%	1311560	-3.34%
2020-21	159.2	5.64%	1056000	-19.49%
2021-22	207.8	30.53%	1286580	21.84%
2022-23	242.6	16.75%	1499500	16.55%
2023-24	270	11.29%	1708900	13.96%

Source: Reserve Bank of India, Database on Indian Economy (DBIE) – Statistics: Payment Systems, Retrieved from the RBI website.

Table 2

Paired Sample Statistics (RTGS Transactions)

		Mean	N	SD
Volume	Pre	129.875	4 (years)	18.22
	Post	219.9	4 (years)	47.81
Value	Pre	1204368	4 (years)	168945.67
	Post	1387745	4 (years)	280427.54

Source: Compiled by author using RStudio

Table 3

Paired Sample Test (RTGS Transactions)

	Paired differences					t- stat	D.F	Sig. (2-Tailed)
	Mean	SD	SE Mean	95% CI of the difference				
				Lower	Upper			
Post minus Pre (Volume)	90.025	29.70	14.85	42.75085	137.2992	6.06	3	0.009
Post minus Pre (Value)	183377.3	145453.11	72726.55	-48067.74	414822.24	2.52	3	0.086

Source: Compiled by author using RStudio

The volume of RTGS transactions during 2016-17 was recorded at 107.8 million, which increased to 124.4 million by 2017-18 and recorded a growth rate of 15.40%. In 2019–20, there was a decline in the growth rate of transaction volume. The volume of transactions increased by 39.80% throughout the four years prior to COVID-19, from 2016–17 to 2019–20. With a growth rate of 30.53%, the transactions skyrocketed from 159.2 millions in 2020–21 to 207.8 millions in 2021–22. From 2020–21 to 2023–24, the amount of RTGS transactions increased by 69.60% during the post-COVID period. The value of RTGS transactions increased by 18.86% between 2016–17 and 2017–18. Between 2017–18 and 2018–19, the growth rate dropped from 18.86% to 16.26% in the value of transactions. The value of the transactions has decreased during the last two years. The growth rate during 2021–2022 was 21.84% and then started to decline in 2022–2023 and 2023–2024, falling to 55% and 13.96%, respectively. The value of RTGS transactions increased by 74.04% altogether between 2016–17 and 2023–24.

Hypothesis 1:

- To test the significance of the difference during the Pre and Post Covid-19, Paired t-test is applied.
- Number of years considered for the study are (2016-17 to 2019-20 – pre-covid, 2020-21 to 2023-24 – post Covid)
- Significance level: 0.05

H_{01}: The mean volume and value of RTGS transactions do not have a significant difference during the pre and post Covid-19. $H_{01:}$ $\mu 1 = \mu 2$

Table 3 shows that the 'p' value of RTGS transactions is 0.086 (0.086>p>0.05), which is slightly higher than the significance level, and the volume of transactions has a significance of 0.009 (0.009<p<0.05). The mean RTGS transactions before and after COVID-19 differ significantly in terms of 'volume'. However, the mean RTGS transactions before and after COVID-19 do not significantly differ in terms of 'value'. In terms of 'volume', the null hypothesis is rejected, whereas in terms of 'value', it is accepted.

6.2 National Electronic Fund Transfer (NEFT)

RBI owns and runs NEFT, a centralised payment system that is used throughout the country. People, businesses, and corporations that have accounts with any participating member bank in the NEFT system can electronically transfer money to any other person, business, or corporation that has an account with any other participating bank in the nation.

While RTGS is utilized for high-value transactions and settles payments instantly, NEFT is best suited for low-value transactions and works in batches. Fees, minimum transfer amounts, and settlement times vary between the two platforms. On February 29, 2024, the NEFT system reached a significant milestone by handling 4,10,61,337 transactions - the most ever completed in a single day.

The Reserve Bank oversees the management of the RTGS and NEFT systems used to settle retail and wholesale payments, respectively. A key milestone was achieved in the development of these systems when, as of December 16, 2019, and December 14, 2020, respectively, RTGS and NEFT began operating around the clock, every day of the year.

Table 4

Growth in NEFT Transactions (Volume and Value)

Year	Volume		Value	
	(Number in Million)	Growth (%)	(₹ in Billion)	Growth (%)
2016-17	1622.1	-	120040	-
2017-18	1946.4	19.99%	172229	43.48%
2018-19	2318.9	19.14%	227936	32.34%
2019-20	2744.5	18.35%	229460	0.67%
2020-21	3092.8	12.69%	251310	9.52%
2021-22	4040.7	30.65%	287250	14.30%
2022-23	5284.7	30.79%	337200	17.39%
2023-24	7264	37.45%	391400	16.07%

Source: Reserve Bank of India, Database on Indian Economy (DBIE) – Statistics: Payment Systems, Retrieved from the RBI website.

Table 5

Paired Sample Statistics (NEFT Transactions)

		Mean	N	SD
Volume	Pre	2157.975	4 (years)	483.68
	Post	4920.55	4 (years)	1801.77
Value	Pre	187416.25	4 (years)	52216.67
	Post	316790	4 (years)	60946.59

Source: Compiled by author using RStudio

Table 6

Paired Sample Test (NEFT Transactions)

	Paired differences					t- stat	D.F	Significance (2-Tailed)
	Mean	SD	SE Mean	95% CI of the difference				
				Lower	Upper			
Post minus Pre (Volume)	2762.58	1322.07	661.04	658.89	4866.26	4.179	3	0.024
Post minus Pre (Value)	129373.8	23625.97	11813	91780.1	166967.4	10.95	3	0.086

Source: Compiled by author using RStudio

A 20% growth rate was observed in the number of NEFT transactions, which reached 1946.4 million at the end of 2017–18 from 1622.1 million in 2016–17. By 2017–18, the value of transactions had grown to 172229 billion, representing a 43.48% growth rate from 120040 billion in 2016–17. The volume of transactions grew at a slower rate at the end of 2019–20 and continued to decline until 2021. For four years, from 2016–17 to 2019–20, the pre-COVID period, the volume of transactions grew at a rate of 69.19 %. With a growth rate of 30.65%, the volume of transactions grew significantly from 3092.8 million in 2020–21 to 4040.7 million in 2021–22. From 2020–21 to 2023–24, the volume of NEFT transactions increased at a rate of 134.87% during the post-COVID period. However, between 2016–17 to 2017–18, the value of NEFT transactions increased at a rate of 43.48%. The growth rate of the value of transactions decreased from 43.48% to 32.34% during 2017–18 and 2018–19. The value of transactions has barely increased over the subsequent year, 2019–20. A growth rate of 9.52% was recorded in 2021–2022, and then there was an upward trend in growth rates of 14.30% and 17.39% in 2021–2022, respectively. The value of NEFT transactions increased by 226.06% altogether between 2016–17 and 2023–24. NEFT has experienced an increase of 700% in its volume and an increase of 670% in its value over the previous decade (2014–23).

Hypothesis 2:

- To test the significance of the difference during the Pre and Post Covid-19, Paired t-test is applied.
- Number of years considered for the study are (2016-17 to 2019-20 – pre-covid, 2020-21 to 2023-24 – post Covid)
- Significance level: 0.05

H_{02}: The mean volume and value of NEFT transactions do not have a significant difference during the pre and post Covid-19. $H_{02:} \mu 1 = \mu 2$

Table 6 shows that the significance in the value of NEFT transactions is 0.086 (0.086>p>0.05), which is slightly higher than the significance level, and the volume of transactions has a significance of 0.024 (0.024<p<0.05). The mean NEFT transactions before and after COVID-19 differ significantly in terms of 'volume'. However, the mean NEFT transactions before and after COVID-19 do not differ significantly in terms of 'value'. In terms of 'volume', the null hypothesis is rejected, whereas in terms of 'value', it is accepted.

6.3 Unified Payments Interface (UPI)

NPCI developed UPI, a real-time digital payment system. This is regulated by the Reserve Bank of India which enables P2P and P2M transactions. Without needing bank account details for instant money transfers, UPI links multiple bank accounts to a mobile application. It operates 24/7 including holidays and weekends. UPI ensures high speed, cost effective and secure transactions through two-factor authentication and end-to-end encryption. This system supports bill payments, merchant transactions and automatic recurring payments through UPI AutoPay. BHIM, Google Pay, PhonePe, Paytm are few UPI-enabled applications that allow widespread accessibility across India.

Table 7

Growth in Volume and Value of UPI Transactions

Year	Volume		Value	
	(Number in Million)	Growth (%)	(₹ in Billion)	Growth (%)
2016-17	17.9	-	69	-
2017-18	915.2	5012.85%	1098	1491.3%
2018-19	5353.4	484.94%	8770	698.725%
2019-20	12518.6	133.84%	21320	143.10%
2020-21	22330.7	78.38%	41040	92.50%
2021-22	45956.1	105.798%	84160	105.07%
2022-23	83714.4	82.16%	139100	65.28%
2023-24	131129.5	56.64%	200000	43.78%

Source: Database on Indian Economy (DBIE) Reserve Bank of India, Database on Indian Economy (DBIE) – Statistics: Payment Systems, Retrieved from the RBI website.

Table 8

Paired Sample Statistics (UPI Transactions)

		Mean	N	SD
Volume	Pre	4701.275	4 (years)	5709.764
	Post	70782.675	4 (years)	47514.634
Value	Pre	7814.25	4 (years)	9805.027
	Post	116075	4 (years)	68853.41

Source: Compiled by author using RStudio

Table 9

Paired Sample Test (UPI Transactions)

	Paired differences					t- stat	D.F	Sig. (2-Tailed)
	Mean	SD	SE Mean	95% CI of the difference				
				Lower	Upper			
Post minus Pre (Volume)	66081.4	41906.76	20953.38	-600.63	132763.44	3.15	3	0.051
Post minus Pre (Value)	108260.75	9805.027	68853.41	13637.58	202883.92	3.64	3	0.036

Source: Compiled by author using RStudio

In 2016-17, the UPI transactions (volume) were recorded at 17.9 million, which increased to 915.2 million by the end of 2017-18 and recorded a massive growth rate of 5012.85%. The value of transactions was recorded at 69 billion in 2016-17, which increased to 1098 billion by the end of 2017-18 and recorded a growth rate of 1491.3%. By the end of 2019-20, the growth rate in the volume of transactions showed a decreasing trend. During the pre-covid period of 4 years which is from 2016-17 to 2019-20, the volume of transactions showed a growth of 69836.31%. The volume of transactions rose from 22330.7 million in the year 2020-21 to 45956.1 million in 2021-22 with a growth of 105.8%. The growth rate UPI transactions (volume) during the post-covid period is 487.22% from the year 2020-21 to 2023-24. However, between 2016–17 to 2017–18, the value of UPI transactions increased at a rate of 1491.3%. The growth rate of the value of transactions decreased from 1491.3% to 698.73% between 2017–18 and 2018–19. The growth rate has further slowed to 143.10% during the next year, 2019–20. In 2021–2022, the growth rate increased to 105.07%. In 2022–2023 and 2023–2024, the growth rate decreased by 65.28% and 43.78%, respectively. The total value of UPI transactions increased by 289755% between 2016–17 and 2023–24.

Hypothesis 3:

- To test the significance of the difference during the Pre and Post Covid-19, Paired t-test is applied.
- Number of years considered for the study are (2016-17 to 2019-20 – pre-covid, 2020-21 to 2023-24 – post Covid)
- Significance level: 0.05

H_{03}: The mean volume and value of UPI transactions do not have a significant difference during the pre and post Covid-19. $H_{03:}$ $\mu 1 = \mu 2$

From table 9, it can be observed that the significance for the 'volume' of transactions is 0.051 (0.051>p>0.05) which is slightly higher than the level and the significance of the 'value' of UPI transactions is 0.036 which is lower than the significance level.

The null hypothesis is rejected since it can be inferred that there is a substantial difference between the mean UPI transactions before and after COVID-19 in terms of both "volume" and "value."

6.4 Mobile Banking

When mobile devices such as tablets and smartphones etc. can be used to conduct financial transactions, it is termed as mobile banking. Mobile banking enables the customers to perform their various financial transactions such as balance checking, funds transfer, bills payments, cheque deposits etc. the mobile applications provide security features like biometric authentication and real-time notifications which make it convenient, efficient and accessible to use.

Table 10

Growth in Volume and Value of Mobile Banking Transactions

Year	Volume		Value	
	(Number in Million)	Growth (%)	(₹ in Billion)	Growth (%)
2016-17	976.85	-	13104.76	-
2017-18	1872.26	91.66%	14738.54	12.47%
2018-19	6200.32	231.17%	29584.07	100.73%
2019-20	16188	161.08%	17281.26	-41.59%
2020-21	25803.37	59.40%	92012.12	432.44%
2021-22	50684.231	96.42%	149613.71	62.60%
2022-23	80533.823	58.89%	220316.28	47.26%
2023-24	125259.921	55.54%	306870.88	39.29%

Source: Reserve Bank of India, Database on Indian Economy (DBIE) – Statistics: Payment Systems, Retrieved from the RBI website.

Table 11

Paired Sample Statistics (Mobile Banking Transactions)

		Mean	N	SD
Volume	Pre	6309.36	4 (years)	6969.53
	Post	70570.34	4 (years)	42777.56
Value	Pre	18677.16	4 (years)	7471.58
	Post	192203.25	4 (years)	92720.26

Source: Compiled by author using RStudio

Table 12

Paired Sample Test (Mobile Banking Transactions)

	Paired differences					t- stat	D.F	Sig. (2-Tailed)
	Mean	SD	SE Mean	95% CI of the difference				
				Lower	Upper			
Post minus Pre (Volume)	64260.98	36070.42	18035.21	6865.73	121656.22	3.56	3	0.037
Post minus Pre (Value)	173526.1	89839.47	44919.73	30573.52	316478.66	3.863	3	0.0306

Source: Compiled by author using RStudio

During the year 2016-17, the volume of Mobile Banking transactions was recorded at 976.85 million, which increased to 1872.26 million by the end of 2017-18 and recorded a growth rate of 91.66%. The value of transactions was recorded at 13104.76 billion in 2016-17, which increased to 14738.54 billion by the end of 2017-18 and recorded a growth rate of 12.47%. The volume of Mobile Banking transactions had a growth rate of 231.17% in 2018-19 and the rate dropped to 161.08% by the end of 2019-20. During the pre-covid period over a period of 4 years from 2016-17 to 2019-20, the volume of transactions showed a growth rate of 1557.16%. With a growth rate of 96.42%, the mobile banking transactions increased from 25803.37 million in 2020–21 to 50684.23 million in 2021–22. The growth rate in the volume of Mobile Banking transactions during the post-covid period is 385.44% from the year 2020-21 to 2023-24. However, the value of Mobile Banking transactions showed a growth rate of 12.47% from 2016-17 to 2017-18. From 2018-19 to 2019-20 there is a decline in the value of transactions from 29584.07 billion in the year 2018-19 to 17281.26 billion in

the year 2019-20. For the later year i.e 2020-21, there has been a massive increase in the value. The growth rate was 432.44% in the year 2020-21. From the years 2021 to 2024 the growth rates dropped. There is an increase in the value of transactions on a year-to-year basis, but the growth rates show a decreasing trend. The overall growth of the value of NEFT transactions from 2016-17 to 2023-24 was recorded at 2242%.

Hypothesis 4:

- To test the significance of the difference during the Pre and Post Covid-19, Paired t-test is applied.
- Number of years considered for the study are (2016-17 to 2019-20 – pre-covid, 2020-21 to 2023-24 – post Covid)
- Significance level: 0.05
- **H_{04}:** The mean volume and value of Mobile Banking transactions do not have a significant difference during the pre and post Covid-19. $H_{04:}$ $\mu 1 = \mu 2$

From table 12, it can be observed that the significance for the volume of transactions is 0.037 ($0.024<p<0.05$) and the significance of the value of Mobile Banking transactions is 0.0306, both of which are lower than the significance level. The null hypothesis is rejected as it is inferred that, for mobile banking transactions there is a significant difference in the mean 'volume' and 'value' before and after COVID-19.

Table 13

Summary of Acceptance and Rejection of Null Hypotheses

	RTGS (H_{01})	NEFT (H_{02})	UPI (H_{03})	Mobile Banking (H_{04})
Volume	Reject	Reject	Reject	Reject
Value	Accept	Accept	Reject	Reject

From the above table, in terms of 'volume', there is a significant difference in the mean transactions of RTGS, NEFT, UPI and Mobile Banking and the null hypothesis is rejected. However, in terms of 'value', there is no significant difference in the mean transactions of RTGS and NEFT transactions and therefore the null hypothesis is accepted. But, there is a significant difference in the mean transactions of UPI and Mobile Banking transactions and the null hypothesis is rejected.

7. Findings and Conclusion

By studying the volume and value of RTGS, NEFT, UPI, and mobile banking transactions from 2016–17 to 2023–24, the current study offers a thorough analysis of the development of digital payment systems in India. The paper provides convincing empirical evidence of the pandemic's transformative effect on digital payment behaviors through a comparative analysis of pre- and post-COVID-19 data backed by paired t-tests. The findings show that during the post-COVID era, transaction volume increased statistically significantly across all four digital payment systems. This consistent increase highlights a broad trend towards digital payment methods, which is fuelled by consumers' growing inclination for contactless transactions, higher smartphone adoption, and easier access to digital financial services. The considerable increase in transaction volumes is indicative of a larger shift in the Indian financial ecosystem's infrastructure and behavior.

The rise in transaction value between the pre- and post-pandemic periods was not statistically significant for RTGS and NEFT. These results imply that the cost of high-value transfers was mostly constant despite an increase in transaction frequency. This stability suggests that retail digital payment patterns were more vulnerable to pandemic-induced changes than institutional and corporate payment behaviors, which are usually linked to RTGS and NEFT. On the other hand, UPI and mobile banking showed notable gains in transaction volume

and value, indicating a major extension of their functional responsibilities in the context of digital payments. In particular, UPI experienced exponential growth, evolving from a young platform into a major payment method. Widespread adoption across demographic and socioeconomic groups has been fuelled by its ability to enable real-time, low-cost, and user-friendly transactions. The development of banking applications, improved security features, and rising customer confidence in mobile-based financial services all contributed to the similar trajectory of mobile banking.

When considered in total, the results point to a significant structural change in India's post-COVID digital payments sector. UPI and mobile banking have become the main drivers of the expansion of digital payments, especially for routine personal and business transactions, while RTGS and NEFT continue to play their traditional roles in facilitating high-value and institutional transactions. The diversity of payment preferences and the growing importance of flexible, technologically advanced payment platforms are highlighted by this divergence.

Overall, the study confirms that India's already rising digitalization trajectory was accelerated by the COVID-19 outbreak. The notable increase in digital payment activity, particularly in UPI and mobile banking, indicates long-term shifts in consumer behavior and reflects the expanding integration of technology into financial activities. In addition to offering a basis for additional scholarly research, policy development, and strategic innovation in the field of digital payments, these findings deepen our understanding of the forces influencing India's digital financial ecosystem. As most Indians practice their business online, their habits and spending patterns are expected to become more accessible. This highlights the increasing significance of business analytics in understanding payer's behavior. Banks and other payment providers who incorporate artificial intelligence and data analytics are expected to invest heavily in fraud detection and prevention. In the years 2003-2004, several initiatives were introduced to take suggestions and put the suggestions into practice. Significant progress was made with the introduction of UPI Lite and the integration of RuPay Credit Cards and the UPI. Various Programs were designed for the advancement of Digital Financial Inclusion. Some of them include Government of India's BharatNet Project, the Payment Infrastructure Development Fund (PIDF) and the Expanding and Deepening of Digital Payments Ecosystem (EDDPE). Out of all the methods of Digital Payments, RTGS transactions increased by 13% in volume and 14% in value during 2003 and 2004. The volume of the retail transactions increased by 44.1% whereas the value increased by 20.1%. By the end of March 2024, RTGS services were provided by 170855 IFSC's of 247 member banks. During the same period, RTGS system was upgraded by the Department add added new powers by implementing Foreign Contribution (Regulation) Act (FCRA).

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