Anusandhanvallari
Vol 2024, No.1
December 2024
ISSN 2229-3388

Digital Banking and the UPI Revolution in India

[1]Anjali Bansal, [2]Seema Sahdev
[1]Associate Professor, Economics Department, Kalindi College, University of Delhi, East Patel Nagar, New Delhi 110008, India.
[2]Professor, Geography Department, Kalindi College, University of Delhi, East Patel Nagar, New Delhi 110008, India
Email id of corresponding author: seemasahdev@kalindi.du.ac.in

Abstract: This paper traces the roadmap of digital banking in India, with a focus on the use of unified payments interface (UPI). It brings out that policy changes, infrastructural advancements, widespread use of inexpensive smartphones and the move to app-based services have replaced the local-branch banking with a scenario where there is high reliance on computers and mobile connectivity. Mobile and internet banking, smart cards, prepaid instruments (PPIs) and IMPS (immediate payment service) have been predominant in driving the growth of UPI. The challenges are manifested in its unequal access, especially in the rural areas; the digital divide; cybersecurity concerns; consumer protection and complaint resolution. The paper also highlights that the adoption of digital currency appears to be slow as compared to UPI due to issues related to trust, awareness and operationality. This kind of comprehensive and sustainable development can only be achieved with clear policy framework, tackling of the security related issues, and substantial capacity building.

Keywords: Unified Payments Interface (UPI), digital banking, digital literacy, IMPS,

1. Introduction

The banking system of India is undergoing one of its biggest revolutions since independence. The digital technology infrastructure combined with deep smartphone penetration, political reforms and changing customer expectations has made a big difference. We no longer have an old system dominated by branches, in which cash was the king for individuals and businesses and the spread of branches drove banking. This has given way to a digitally interconnected economy where instant payments, app-based banking and platform-based financial services dominate the modern economic life. The move towards digital India, decapitalization of the economy and the financial inclusion drive has made the policy climate friendly towards digital advancements. Digital banking now includes mobile and internet banking, card networks, prepaid instruments and instant interbank transfers within India. This move has also got a boost from unencrypting payments systems/infrastructure and more robust, interconnected communication lines to support frictionless account movements between banks and apps.

Mobile banking use has also changed consumer behaviour on the incentives side. Banks and players in the NFC space or regulators have also developed their systems in the rural and semi-urban areas as the urban digital ecosystem has shifted to semi-urban and rural areas. It is built on top of the Unified Payments Interface (UPI), a program that serves as shorthand for India's unfolding digital payments narrative. UPI was launched in April 2016 and has a very procurable cost structure for money transfer between matching accounts of apps, bank or merchant location. UPI had the fastest adoption possible, faster than any other payment service provider anywhere in the world at a stage when customers were ready for instantaneous transaction over barcode or mobile-based or ID-based. This open and technology-neutral platform has invited strong participation from the private sector, serving to ensure common protection of data governance and consumer welfare across member states.

These are the features that are frequently cited as to why UPI scaled so fast, in such high numbers, and yet was able to keep everything from misdemeanour attack (Cornelli et al., 2024).

2. Review of Literature

Gupta & Raza (2024) explained "digital" as the predominant buzzword in all industries, while digital transformation refers to the wide spread of changes within industries and societies due to technology adoption. This meant that India's banking sector was shifting quickly to digitalization, like others, and customers found banking a convenient or different experience after regular bank activities became one-off instances. They pointed out that mobile banking had become a major type of digital banking, offering such services as account opening, funds transfer and cashless payment linking and loan application. They pointed out that National Payments Corporation of India designed IMPS that brought the country world's first interbank fund transfer-service, mobile platform and later just expanded its parenting to ATM and Internet banking with 722 member banks by April 2023 making transactions from an astronomical amount at times transactions per day surpassing 355.69 million as of December-2020. They also noted that digitalization had lowered cash-handling risks and facilitated 'anytime, anywhere banking' as most of the banks had introduced their mobile apps. The RBI had also undertaken steps to enhance payment and settlement systems, they said. While they claimed banks had enjoyed many advantages from the implementation of emerging technologies, they warned that leveraging digital transformation would create challenges around skills shortages and customer safety. They mentioned that they relied on third-party nodes and described the larger digital shakeup in the Indian banking ecosystem.

Singh et al. (2024) were heard to comment that the Indian digital payment space had experienced a massive transformation, largely riding on government driven programs like Digital India, demonetization and Pradhan Mantri Jan Dhan Yojana which gave wings to cash less migration throughout the country. The authors have been cited as having discussed the factors such as financial inclusion, internet penetration and increase in smartphone penetration driving this growth and demonstrating diagrammatically the evolution of digital payment architecture comprising RTGS, credit transfers, debit transfers, direct debits card-based payments and prepaid instruments. They further stated that the global ransomware attack has only highlighted the need for evolving such a mechanism at an expedite pace, to ensure cyber security and keep pace with advancement. Governance today at time of filing report they submitted another one saying India is rapidly moving towards a digital economy wherein a majority of financial transactions are progressively getting captured in the digital footprints.

Govind et al. (2024) bring to attention an analysis on the transformative potential of E-rupee and digital payment systems in remolding India's financial ecosystem, highlighting that erupt was developed to enhance financial inclusiveness, curb dependence on cash machine as well as ensure transparency. They observed that digital channels like UPI and mobile wallets already expanded the formal financial system by providing secure, efficient and convenient modes of payment which would also help in achieving the objectives outlined under Digital India and less-cash economy. The study reportedly included urban Patna using primary data obtained through structured Google Forms and interviews, supplemented by secondary sources such as government documents, newspapers and e-journals. Their study was believed to divulge emerging digital usage trends and suggested that large scale adoption of UPI and E-rupee may create economic revolution which could be a guide for bankers, policy maker and businesses working in the urban Patna's digital fueled landscape.

Cornelli et al. (2024), the Unified Payments Interface (UPI) had become India's largest payments ecosystem, and purportedly facilitated more than 15 billion transactions a month as of November 2024. They noted that the platform grew thanks to an open, technology-agnostic architecture which allowed for frictionless transactions

through 3rd party apps and user-friendly interfaces, as well as its zero customer transaction fees. According to the authors, UPI permitted the use of mobile number or identity-based proxies and interoperable QR codes for payment-related tasks, while its growth was complemented by active private-sector involvement with stricter regulation on data storage and usage. They noted that favorable regulation had facilitated rapid scaling, and tackled operational problems such as technology problems, uneven interoperability and cross-border scalability. Generally, the model was praised for how much it had scaled financial inclusion is in India without sacrificing financial stability and consumer protection.

Badak et al. (2023) were known to have explored the emergence of India's Digital Payments boom and pointed out that the exponential growth of Unified Payment Interface (UPI) had led over 100 billion digital transactions in FY 2023. They mentioned that the revolution started mostly from demonetization in year 2016 and then continued to speed on fueled by increased use of internet, effects of COVID-19, growing financial literacy and government efforts. It was claimed their research looked at changes in consumer activity and socio-economic advantages for rural populations lacking access to banks before focusing on the potential roles of FinTech companies, digital wallets and mobile banking as frictionless platforms for transactions. They also reported disturbances in the functioning of UPI systems by a "hacker" which were threatening financial stability and user confidence. They further highlighted that the Reserve Bank of India's regulatory intervention had added a layer of safety to transactions and that RBI was also planning on launching Digital Currency to enhance the financial environment down the line.

Khandal (2023) said banking was a lifeblood of modern commerce, which had been in the forefront of India's economic rise. "The banking industry, like any other industry, has experienced lightning-fast digital evolution and helped take services far beyond physical walls or structures thus making 24×7 banking a reality," the author pointed out. Digitalization allows more convenience, better service quality and lower costs of operations by minimizing the staff based manual systems was said to be done briefly. They noted that in the beginning, people could not access internet banking because of limited computer resources available to humanity and it had been expensive therefore excluded the middle class and top-income earners up to now until smartphone invasion which brought the poor into digital banking. They pointed out that with the advent of smartphones, which had become affordable devices and could replicate computer functions, banks were forced to roll out mobile applications and develop digital platforms. There has been a significant rise in digital transactions after demonetization in 2016 and during the COVID-19 social distancing norms, consistent with government's policy to affect a shift to non-cash payments mechanisms using UPI and BHIM. The study was carried on 300 respondents in Delhi About Awareness, Problems and motive to opt UPI/Mobile banking over traditional banking services.

George et al. (2023) wrote that the UPI in India had become a cutting-edge digital payments system that would allow the transfer of money and bill payment instantly, under one umbrella. They said UPI had disrupted the Indian transactional scene, by offering speed and convenience along with accessibility in day-to-day transactions. They also emphasized that, the system had a number of merits; convenience, security and cost effectiveness but encountered serious implementation issues like low level of user knowledge and continuous security threats. However, they claimed that UPI had tremendous scope to break the mold in digital payment space as well as expand commercial reach by providing more ways for businesses to interact with users in a better way.

Srivastava and Sharma (2022) documented that India was one of the fastest growing countries in the world where IT sector flourished at a breakneck speed, overhauling various domains including banking, security, social media etc. They said that though digital payments were introduced quite a few years ago, its penetration was minimal among the public for a long time; but past four years saw an impressive growth in its adoption. They

observed that digital payments were online transactional platforms driven by IMPS, mobile banking, net banking- and particularly the UPI, which was one of the major innovations to 20 Sangeet Paul Choudary and Kartik Hosanagar be approved on part of NPCI. They pointed out that there were over 55 UPI applications, including popular ones like PhonePe, Google Pay, BHIM, Freecharge and Paytm leading consumer choice. One research undertaken by them was to analyze the pace of transaction volume and frequency growth during May 2017 to May 2021 from which they found that the IT revolution had played a sizable role in contributing to digital payment services maturity nationwide.

Mahesh and Bhat (2022) also mentioned India was experiencing the transition from a largely cash-oriented economy to a low-cash society, fueled by widespread smartphone proliferation and fast-growing internet usage, fostering technology adoption in financial dealings. They had submitted that digital payments were overtaking the cash transactions and one such transaction mode was through UPI, which had grown significantly over the last five years as a major channel for financial inclusions. Their objective was to study the literature in each field of digital payment, and their main areas were UPI, technology acceptance model (TAM), continuance intention, recommendation behavior. They iterated that SWOC and BCDA analytical frameworks were employed through structured literature review for research gaps and agendas. Their findings revealed that despite various digital payment systems being investigated in existing literature, very few studies had concentrated on UPI from the perspective of digital financial inclusion and thus, further research could well be in order as technological conditions change. They claimed that their research was the first to relate digital payments, UPI and inclusive financial growth, providing directional inputs for policymakers and service providers towards enhancing India's shift to a less-cash economy.

Gopinath et al. (2022) were cited as having consider the role of retail banking in today's financial scenario and how consumers viewed safe and effective means for everyday transactions to transition India to a cashless economy. They were believed to have pointed out that Indian users massively used the UPI, IMPS and NFS for carrying out payment transactions and the shift towards cashless model was inevitable. The research was said to have quantitatively gauged trends for recent transactions figures in volume and value besides understanding the effect of COVID-19 on digital transactions with respect to UPI, IMPS and NFS. The data were reportedly obtained from the NPCI portal for a period of October 2017 to November 2019 (Pre-pandemic), while that of January 2020-February 2022 referred as post-pandemic phase.

Dhamija et al. (2022) indicated that the Indian banking sector experienced a high growth in digital payment transactions and deployment of various payments systems by both public and private players during demonetization period. They also said that while the private platforms were more popular, public initiatives like UPI had been inventive in coming up with new modes of digital transaction. They also added that e-Rupi was introduced as a voucher-based payment system by the Government of India, which aimed to ensure welfare schemes, healthcare benefits and other support services reached the destinations more effectively.? They stated that they had studied the e-Rupi operational elements and performed an empirical analysis and comparison to alternative digital payment platforms.

Sankararaman & Suresh (2021) noted that Indian banks had, for over two decades kept aside to diversify services on electronic mode to include mobile banking, ATMs and digital payments and indicated that the Unified Payments Interface (UPI), introduced as a real-time instant settlement system in 2016 was handling 47% of retail clearing transactions in India. They said this fast growth had prompted their study on the awareness, satisfaction, problems encountered and resolution time among UPI users. they mentioned that descriptive research design was used, 119 samples were obtained through a structured questionnaire and convenience sampling was utilized. In

their findings, 86% participants were aware of UPI as a digital payment tool and 31% had chosen UPI as the primary mode of payment. Chi-square analysis reported a significant relationship between age and satisfaction towards the UPI usage, whereas one-way ANOVA revealed statistically significant differences among the three age categories in terms of Frequency of Use. They concluded with suggesting that regulatory authorities must have made cyber security potent and UPI sharp across the country.

Kaur et al. (2021) pointed out that India had been transitioning toward a cashless economy in the post-demonetization period, which played n accelerating role on digital payment systems like IMPS, RTGS, NEFT, E-wallets, Aadhaar Pay, Debit Cards and UPI. "Digital payments have become a part of our daily living and we even find small vendors like ice-cream sellers, milkmen and vegetable vendors adopt digital wallets and QR code-based payments," they said. The authors pointed to programs such as “Make in India” and “Digital India,” which Prime Minister Narendra Modi had brought to the center of economic change and technological modernization. They stressed that digitization enabled short- and long-term business efficiency through improved customer experience, speed to market, leveraging big data and operational excellence. The paper also stated that the ‘Digital India’ movement had envisioned a faceless, paperless and cashless service delivery system which paved way for FinTech industry revolution and emergence of several Indian unicorns like Paytm, Bill Desk, Ponape, Policy Bazaar and Razor Pay among others.

Mahindrakar (2020) reported that the Government of India has regularly encouraged and assimilated technology as a tool to promote digital inclusion among citizens. He stated that with various new technologies like Artificial Intelligence, Machine Learning, Biometric Enabled Access etc., newer payment platforms such as Unified Payment Interface [UPI], Immediate Payment System [IMPS] and other mobile based banking facilities have been introduced. He also said that the growth of FinTech and Digital Finance as well as new digital products like the popular ones, which he explained ease fast transaction processes become user-friendly for convenience were contributing to sageness in financial transactions. The report was reported to have highlighted the increasing relevance of Digital Payments & FinTech innovations in advancing digital financial inclusion in India.

Singh & Malik, 2019 they stressed on the fact that IT would be a game changer for banking, (where) Indian banks have built very robust foundations to adopt contextual banking and open APIs. Digital services were an advancement of the banking business to customers through mobile phones and computer interfaces despite the inherent risks, it read. In India, the technological preparedness of banking was on a par with global scale but customers in rural India were still finding it difficult to use digital payment systems. The paper was reported to discuss new opportunities and challenges in the rural banking industry, especially when it comes to digitalization, and evaluate whether digital literacy has become part of the bank-customer relationship today by exploring both what technological solutions banks are implementing and how rural customers respond to these services.

3. Findings from the Reviews Study

Author(s) & Year	Focus	Findings	Drivers	Challenges	Implications / suggestions
Gupta & Raza (2024)	Broad digital transformation in Indian banking	Digitalization made banking more convenient. Mobile banking enabled account opening, fund transfers, cashless payments, and loan access. IMPS offered instant 24×7 interbank transfers; 722 member banks by Apr	IMPS expansion, bank-specific mobile apps, RBI strengthening payment systems	Expertise gaps and customer security concerns	Upskilling, customer awareness, robust security and risk management

		2023; transactions reached 355.69 million by Dec 2020 (as reported).			
Singh et al. (2024)	Growth of India's digital payment ecosystem	Growth driven by Digital India, demonetization, and PMJDY. Ecosystem included RTGS, credit/debit transfers, direct debits, cards, and PPIs. Digital platforms began to dominate payment framework over cash.	Govt initiatives, smartphone/internet growth, inclusion push	Cybersecurity vulnerabilities; need for trust-building	Strengthened digital safety mechanisms and consumer protection
Govind et al. (2024)	E-rupee and digital payments with urban evidence	Focused on urban Patna using primary data (Google Forms/interviews) plus secondary sources. UPI and E-rupee were viewed as capable of reducing cash dependence and improving transparency/inclusion.	Digital India, less-cash policies, formal network expansion	Adoption variability and evolving user patterns	Policy and institutional insights for scaling E-rupee/UPI adoption in urban contexts
Cornelli et al. (2024, Dec)	UPI dominance and regulatory/architecture view	UPI processed 15+ billion transactions/month by Nov 2024 (as stated). Growth attributed to open, tech-agnostic design, multiple third-party apps, user-friendly UX, zero customer fees. and QR supported scale.	Open architecture, private-sector participation, supportive regulation	Technical glitches, uneven interoperability, cross-border scalability limits	Maintain stability and consumer protection while improving operational robustness
Badak et al. (2023)	India's digital payment revolution post-2016	UPI drove 100+ billion digital transactions in the financial year 2022-23 (as reported). Growth had accelerated after demonetization; aided by internet access, COVID-19 related shifts, financial literacy, and government support.	FinTech firms, wallets, mobile banking, RBI support	Hacker interference risks; trust and stability concerns	Stronger regulation and security; anticipated role of future digital currency
Khandal (2023)	User awareness and motivations for UPI/mobile banking	Digitalisation has enabled round the clock banking and have reduced the cost and operational dependence on manual systems. The affordability of Smartphone has helped immensely to propagate the digital access to lower-income groups.	Smartphone revolution, demonetization, COVID-era behaviours, govt promotion	User-level problems and barriers (awareness, usability implied)	Improve user education, UX, support systems for smoother adoption
George et al. (2023)	Features and challenges of UPI	UPI has enabled instant fund transfers and bill payments. Its advantages include convenience, security, and cost-efficiency; the challenges include inadequate awareness and ongoing security concerns.	Simple unified platform design	Awareness deficits and security apprehensions	Awareness campaigns and security reinforcement

Srivastava & Sharma (2022)	Growth of digital payments & UPI apps	The expansion of information technology industry has immensely helped in the banking transformation. The adoption of UPI apps surged notably in the last four years of the study period. PhonePe, Google Pay, BHIM, Freecharge, Paytm dominated the scenario.	IMPS, mobile/net banking, UPI ecosystem	Early low adoption; implied digital divide	Continued expansion of accessible platforms and user trust
Mahesh & Bhat (2022)	Literature review on UPI & inclusion	UPI expanded strongly over five years; review used SWOC and ABCD frameworks. Found limited 'UPI-specific' work on digital financial inclusion.	Smartphone/internet-led technology acceptance	Research gap in UPI-focused inclusion studies	Need for more targeted empirical and behavioural studies
Gopinath et al. (2022)	Pre/post COVID transaction trend analysis	Empirically assessed the trends in UPI, IMPS, and NFS using NPCI data (Time period: Oct 2017–Nov 2019; Jan 2020–Feb 2022). UPI emerged as the most preferred platform, during and after COVID.	Pandemic-driven behavioural shift, platform efficiency	Noted through comparative trends rather than deep risk analysis	Evidence base for policy and bank strategy to scale UPI further
Dhamija et al. (2022)	e-Rupi and comparative platform evaluation	Digital usage rose during demonetization with many public/private platforms. e-Rupi introduced as voucher-based welfare/benefit delivery mechanism.	Affordable internet, rising literacy, govt innovation	Comparative performance and adoption questions implied	Use e-Rupi for targeted, efficient benefit delivery alongside mainstream platforms
Sankararaman & Suresh (2021)	UPI awareness/satisfaction study	UPI accounted for a large share of retail clearing (as reported). Study with 119 samples found high awareness; age linked with satisfaction and usage frequency differences.	Long-term bank commitment to e-channels	Need for stronger cybersecurity and wider adoption	Security upgrades and broader awareness drives
Kaur et al. (2021)	Digitalization & cashless transition overview	Post-demonetization push expanded IMPS, RTGS, NEFT, wallets, Aadhaar Pay, cards, UPI. Small vendors adopted QR/wallet payments. Digital India as core national driver.	Govt campaigns and fintech growth	General risk/transition challenges implied	Strengthen long-term efficiencies via better customer experience and data use
Arvind (2021)	UPI & Bharat QR conceptual explanation	UPI turned smartphones into virtual debit cards for instant transfers; Bharat QR simplified merchant payments.	Bank app proliferation across platforms	Adoption barriers in practice not deeply detailed	Reinforces UPI's role in simplifying everyday payments
Mahindrakar (2020)	Tech-driven digital inclusion	AI/ML, biometrics, blockchain supported new platforms like UPI and IMPS. FinTech growth advanced	Emerging technologies and govt support	Implied need for ongoing infrastructure and trust	Sustained innovation aligned with inclusive policy

		inclusion via fast, user-friendly products.			
Singh & Malik (2019)	Rural digital banking opportunities/ challenges	Digitalization from CTS to mobile/UPI/BHIM became defining trend. Rural users still faced adoption difficulties; digital literacy was critical.	Open APIs, improved banking infra	Rural adoption barriers, literacy gaps	Focus on rural digital literacy and tailored initiatives

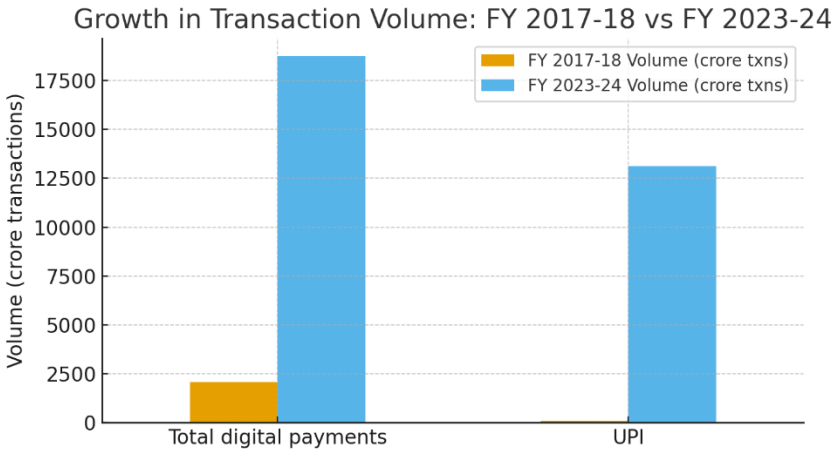
Source: Secondary Source as per column 1

4. An Assessment

This UPI-led expansion has been representative of a forward moving Indian digital payments scenario. As an ecosystem UPI brings the banks and third-party players to compete on expertise, up-time, value-added services, and trust. The result has been a quicker pace of innovation in payments, as well as more pressure on service providers to compete on speed, consumer experience, fraud protection, and customer service. There is nothing weird about UPIs today; they are a part of retail transfers and payment for small merchants (SME, subscription, bill pay). All this has led to an obvious reduction in cash transactions on a day-to-day basis in some parts of the country, although there are undoubtedly still plenty of habitual users within certain geographical areas and sections of the population. It is no longer considered just as a payment service but also a public digital infrastructure making an access available to one and all. The ability of the very poor, micro-entrepreneurs and first-time technology users to adapt to it, is a testament to what open and inclusive platforms can help facilitate. This potential of coverage is significant in the Indian economy that has seen income disparities and regional disparities with a little legacy for formal banking services. The evolution of UPI in India must be viewed against the canvas of digital banking, one that is plagued by basic concerns and fresh risk angles. Even as digital services multiply, inclusion is a long way off due to heterogeneity in the levels of digital literacy, device use and connectivity. Rural populations and most-at-risk groups continue to face linguistic barriers, lack of trust in the application security system for complaints mechanism. Studies on rural banking reveals that digital usage is not a technological problem but more of an attitudinal and learning issue. It is indicative of continued institutional-community facilitation instead of just policy pronouncements (Singh and Malik, 2019). But now that digital payments are on the rise, these kinds of distinctions could determine who succeeds and fails in the "last mile" of inclusion for some people, perhaps excluding them from digital transformation altogether. The Indian digital banking marketplace further promises long term viability of financial inclusion due to security and trust factor. Rapid volume growth of UPI interface, increasing adoption and usage of the UPI interface aggravates frauds/social engineering scams/disputes. As such, attention should be paid to customer protection, to increasing success rates of transactions and complaint processing times.

Metric	FY 2017-18 Volume (crore txns)	FY 2023-24 Volume (crore txns)	FY 2017-18 Value (lakh crore)	FY 2023-24 Value (lakh crore)	CAGR Volume (%)	CAGR Value (%)
Total digital payments	2071	18737	1962	3659	44	11
UPI	92	13116	1	200	129	138

Source: Secondary Source



Source: Secondary Source

Table reflects the infographic which shows India's digital payments ecosystem is growing rapidly from FY 2017-18 to FY 2023-24. Overall digital transactions surged from 2,071 crore to 18,737 crore in investments and maturity indicating a robust adoption across banking channels. It was up 4.1% compared to the same period of last year in terms of volume, and the value rose to ₹3,659 lakh crore from ₹1,962 lakh crore showing that trust is growing and high-value transactions are increasing over digital media. The highest jumps are in UPI, which increased from a mere 92 crores to 13,116 crore transactions. The UPI value doubled from one lakh crore to two lakh crore. The high CAGR of UPI reaffirms that it acted as a disruptor.

5. Findings from Study

- India's digital banking ecosystem has developed quickly, thanks to pervasive government initiatives and an increasing number of smartphone users, improved internet penetration, the e-commerce boom all factors to trigger uptake of digital payments.
- Otherwise, cash usage has been maintained by a large portion of the population in short, this is proof that digital transformation is still creating inequalities between regions and age groups.
- UPI and the BHIM app have been pivotal in digitising transactions while nudging users to embrace cashless behaviour.
- BHIM UPI had emerged as the most preferred payment option with very high transaction volume and value credit in the period under reference indicating that citizens are increasingly accessing UPI based payments.
- The open ecosystem and Interoperable model of UPI have brought different banks and third-party apps on a common platform for offering transaction services, this competition has improved the outcome for the consumers in terms of ease of use including merchant acceptance significantly.
- Speed, convenience and low cost have enabled UPI to beat many conventional payment modes on both penetration and daily-use.
- Digital banking and UPI can help meet financial inclusion needs, serving low-income individuals, the underbanked or first-time digital users.
- The emergence of the fintech business models has expanded service reach, reduced its costs, and increased product innovation particularly through mobile first services.
- IMPS and past digital rails laid the groundwork for real-time transactions and conditioned the ecosystem for UPI's massive success.
- Cybersecurity threats, fraud risks and protection gaps leave users wary of long-term trust and extended usage.

- Digital literacy and differences in digital infrastructure especially in rural areas have hindered the full potential of digital banking.
- The Digital Rupee (CBDC) has the potential to bring benefits including quicker payments, inclusion and better monetary control. However, adoption had been slower than UPI due to lack of awareness, request exchanges, doubts on trust and infrastructure.
- Demonetization followed by Covid-19 were significant in the habit formation of contactless digital payments.
- Literature indicates that further effort is necessary with regard to transaction success rates, grievance redressal, privacy considerations, and security measures as well in order for that trust to be maintained UPI wide and digital banking at large.

6. Conclusion

The reviewed literature indicates that India's digital banking environment has moved into a realm of high growth with the help of strong policy advocacy, increased outreach and mainstreaming of smartphone based financial behaviour. Digital banking which was once the delivery channel has now taken precedence over most transaction and engagement for many clients supported by these underlying rails such as IMPS and the organised upgrading of payment and settlement system. Amidst this mammoth change, UPI has taken the crown as the most impactful innovation to have rewritten India's retail payments story through its interoperability, user-friendly nature and tremendous adoption by both banks and third-party applications. Its platform-based model has expanded merchant coverage, reduced cash demand and facilitated access among the poor and non-banked. It is also not merely that the evidence indicates digital inclusion is unequal. At the "last-mile" end of UPI transformation, distant adoption constraints, low digital literacy, and fundamental asymmetries are obstacles yet to be conquered.

References

[1] Arvind, B. L. (2021). Customer's Perception of Upi as A Digital Mode of Payment (With Reference to Coimbatore District). *International Journal of Creative Research Thoughts*, *9*(1), 3988-3999.

[2] Badak, S., Kolte, V., Agrawal, M., & Gupta, S. (2023). Revolution of digital payment in India. *Journal of Mobile Computing, Communications & Mobile Networks*, *10*(3), 29-37.

[3] Cornelli, G., Frost, J., Gambacorta, L., Sinha, S., & Townsend, R. M. (2024, December). The organisation of digital payments in India–lessons from the Unified Payments Interface (UPI). In *SUERF: The European Money and Finance Forum, SUERF Policy Note* (No. 355).

[4] Dhamija, D., Dhamija, A., Ranjan, R., Jha, S. S., & Renu. (2022, September). E-Rupi—Recent Advancement in Digital Payment System. In *International Conference on Innovative Computing and Communications: Proceedings of ICICC 2022, Volume 2* (pp. 205-214). Singapore: Springer Nature Singapore.

[5] George, A. S., George, A. H., Baskar, T., & Martin, A. G. (2023). An Overview of India's Unified Payments Interface (UPI): Benefits, Challenges, and Opportunities. *Partners Universal International Research Journal*, *2*(1), 16-23.

[6] Gopinath, R., Vevek, S., & Sivaprakkash, S. (2022). A paradigm shifts in digital payment transactions: UPI, IMPS & NFS before and after covid-19 to seize opportunity of cashless economy in India. *Central European Management Journal*, *30*(4), 915-923.

[7] Govind, H., Nayan, A., & Gupta, P. (2024). The Evolution of Digital Payments: UPI, E-Rupee and the Future of Currency-in the Context of Urban Patna. *International Research Journal on Advanced Engineering and Management (IRJAEM)*, *2*(03), 495.

[8] Gupta, P., & Raza, Z. (2024). Digital Revolution and Innovation in the Banking and Finance Sectors. In *Data-Driven Modelling and Predictive Analytics in Business and Finance* (pp. 52-70). Auerbach Publications.

[9] Kaur, N., Sahdev, S. L., Chhabra, M., & Agarwal, S. M. (2021, September). FinTech Evolution to Revolution in India-From Minicorns to Soonicorns to Unicorns. In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1-6). IEEE.
[10] Khandal, S. (2023). Customer awareness on UPI and mobile banking: An exploratory study.
[11] Mahesh, A., & Bhat, G. (2022). A systematic review and research agenda of digital payment system with reference to Unified Payment Interface. *International Journal of Management, Technology, and Social Sciences*, *7*(2), 679-709.
[12] Mahindrakar, S. (2020). Technological aspects and digital finance uprising in India. *International Journal for Research in Applied Science and Engineering Technology*, *8*(IX), 856-859.
[13] Sankararaman, G., & Suresh, S. (2021). A study on Unified Payment Interface (UPI) transactions (a digital banking tool) in Chennai city. *Design Engineering*, *7*, 10431-10440.
[14] Singh, A. K., Gupta, V. K., & Agarwal, K. K. (2024). Digital Revolution: Analyzing the Growth of Payment Systems in India.
[15] Singh, R., & Malik, G. (2019). Impact of digitalization on Indian rural banking customer: with reference to payment systems. *Emerging Economy Studies*, *5*(1), 31-41.
[16] Srivastava, Y., & Sharma, R. (2022). Revolution In Digital Payments Through It. *Prestige International Journal of Management and Research*, *15*(1/2), 141-150.