



India's Unified Payments Interface Architecture, Adoption, and the Policy Challenges of a Public Digital Payment Infrastructure

Dr.A.Shaji George¹, Dr.T.Baskar²

¹Independent Researcher, Chennai, Tamil Nadu, India.

²Professor, Department of Physics, Shree Sathyam College of Engineering and Technology, Sankari Taluk, Tamil Nadu, India.

Abstract – This article focuses on the structural change in India's retail payment system, where the Unified Payments Interface (UPI) has emerged as the dominant mode of digital transactions, while debit card transactions have experienced a significant drop since 2021. It delves into the publicly available data from the National Payments Corporation of India, the Reserve Bank of India, and the assessment by the International Monetary Fund to understand how a real-time, interoperable, and largely fee-free payment rail took a cash-centric economy straight into a digital, mobile-first settlement. The article explains the technical architecture that enabled the bank-to-bank transfers to be done in real-time, the enterprise and regulatory choices that led to its adoption, and the economic and social implications of near-universal adoption. It also considers the export of UPI model to other countries as a tool of financial diplomacy, the parallel growth of credit card transactions and the ongoing threats of fraud, concentration, and the unaddressed issue of the revenue model. The article is written to be accessible to a general and professional audience, and it makes a distinction between the facts that are verified and those that are disputed, and considers policy failures as issues for constructive correction, not partisan judgement. It is designed to offer a well-rounded and evidence-based understanding of the successes and ongoing challenges of India's most significant financial innovation in the last decade, for citizens, merchants, policymakers, and researchers.

Keywords: Unified Payments Interface, Digital payments, Financial inclusion, National Payments Corporation of India, Interoperability, Merchant discount rate, Payment sovereignty, Fintech regulation.

1. INTRODUCTION

Majority of Indians have not used a debit card since a long time ago. A swipe, which used to be a symbol of modern banking, has now become a part of the past. It's replaced by a tiny black and white square, the QR code. A customer opens the app, directs a camera on his phone to the code, types in an amount, enters a PIN and the payment is made within seconds. The gesture is a mundane one, performed hundreds of millions of times a day, but one of the most important changes in financial habits by any major economy in recent memory.

The mechanism to make this possible is the Unified Payments Interface, which was introduced in 2016 by the National Payments Corporation of India (NPCI) with the guidance of the Reserve Bank of India (RBI). UPI is a real-time payment network which enables funds to flow directly from bank accounts to bank accounts, irrespective of the bank and application. In financial year 2019-20, UPI has transacted about twenty-one lakh crore rupees in a year. In March 2026 alone, transactions totaled almost thirty lakh crore rupees or three hundred billion United States dollars. What used to take 12 months, now takes 30 days. The network processes approximately seven hundred and fifteen million transactions per day and

policymakers have said they hope to reach one billion transactions per day.

These numbers are significant not only for convenience, but for the fact that they describe. They refer to a restructuring of the movement of a whole country's finances. In India, over 8 out of 10 digital transactions have been done on UPI as opposed to debit cards or net banking. Since 2021, debit card transactions have decreased by about two thirds. The debit card, which was used for cash withdrawal and for making payments, has been superseded on both these fronts small payments are now made through UPI and many of the higher value payments have shifted to credit cards. Many ATMs, these days, allow cash withdrawal via UPI only.

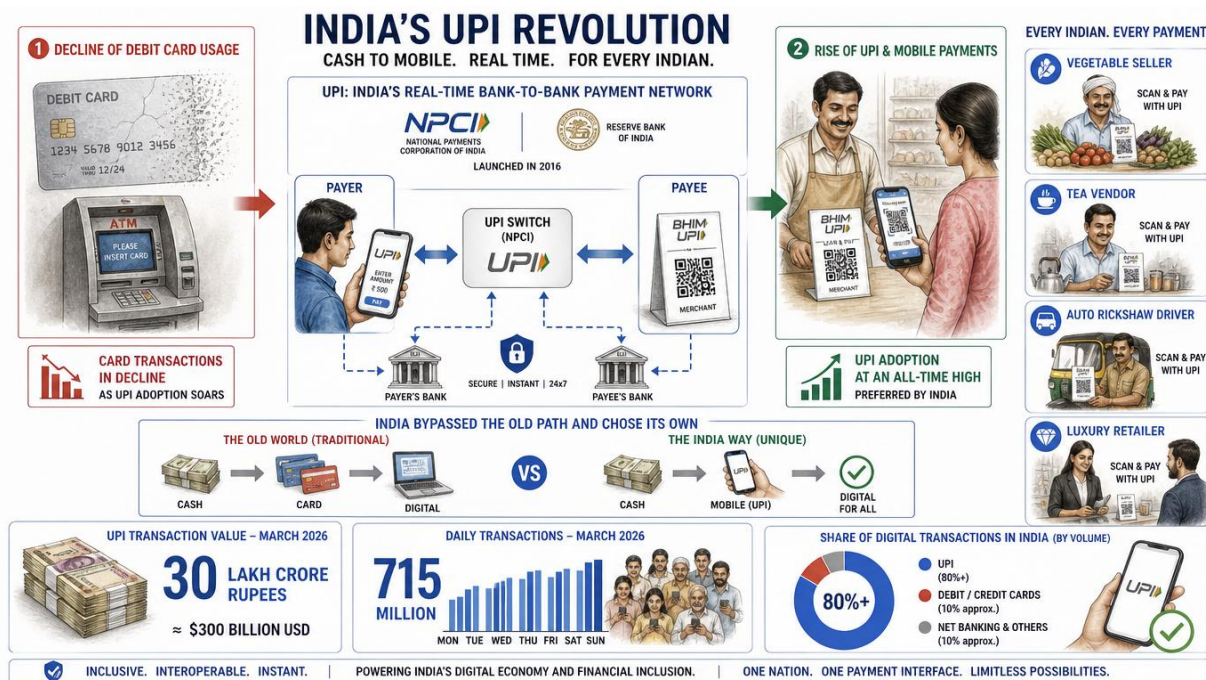


Fig -1: India's UPI Revolution

The Indian experience is unique, not only because of its direction, but also because. The general trend of western economies was cash to cards and then to digital settlement. The Card phase for daily transactions was largely skipped in India and there was a straight jump from cash to mobile mode of payments. A vegetable seller, a roadside tea vendor, an autorickshaw driver and a luxury retailer are now all on the same payments platform, and most often with a printed code. It is this introduction that lays the groundwork for a more in-depth look at how this came about, why it worked, what it has yielded and where caution is needed as this system grows at home and abroad.

2. OBJECTIVE OF THE ARTICLE

This article aims to give a clear, accurate and balanced picture of the Unified Payments Interface (UPI) and the demise of the debit card in India, in an easily understandable way to readers without technical expertise and yet useful to specialists. It aims to describe technology in non-technical terms, pinpoint the institutional and commercial decisions that facilitated adoption, and examine the economic and social implications of a payment system that now runs almost all transactions in the country. Another aim is to look at the policy framework objectively and recognise that some good things have been achieved, but



also to identify some policy decisions that might need to be reconsidered, so that future governments, regulators and companies do not make the same avoidable mistakes. Throughout the article, the author has tried to distinguish fact from speculation, to be free from prejudice against any people or nation, and to be free from condemnation, but rather to criticize as a means of contributing to improvement.

3. METHODOLOGY

This article is based on a synthesis of secondary sources which are publicly available, and not on original empirical research. The key quantitative source is the data on UPI transactions released by the National Payments Corporation of India (NPCI) responsible for running the UPI network, and the Reserve Bank of India (RBI) that regulates retail payments. Comparative international observations are based on the International Monetary Fund's estimates on the share of India in the global real-time payments. Reporting from well-known financial and technology publications provides industry context in terms of user numbers, merchant adoption, and merchant card product behaviour.

The approach of the analysis is interpretive and descriptive. Figures quoted are those as reported by the institutions concerned and care has been taken to indicate where a figure is an annual and not a monthly figure and where a figure is an 'estimate' and not an exact audited figure. If data points are freely shared and not officially verified, the article indicates that they are approximate. Issues of policy failure are cast as analytical observations on publicly discussed matters, for example the lack of a merchant discount rate, the market share concentration, and not as accusations against individuals. There are clear limitations to this approach: it can't validate proprietary transaction data on its own, it only shows data up to early 2026, and constantly changing numbers could be outdated. Readers are advised to refer to the primary disclosure made by the regulators for the latest information.

4. TECHNICAL ARCHITECTURE AND WHY IT MATTERS

To appreciate UPI's success, you need to know what UPI does under the hood of scanning a code. UPI is not a wallet to store money, rather it is software that lies between the user's bank account and the overall banking system that enables instant money transfer without the sender knowing the account number or branch details of the recipient. Every user develops a virtual payment address, usually like an e-mail handle, that is connected in private to a bank account. An authenticated instruction is sent to NPCI's switching network when payment is made, the account is debited, the other account is credited and the settlement is done in real time, round the clock and all year round.

This was achieved because of several technical decisions. The first is called interoperability. Prior to UPI, most digital wallets were closed wallets where money got locked within a particular app and could not be easily transferred to another wallet. These walls were torn down by UPI. Any merchant can use one application and pay with another, as they all link to the same rails. This one decision in design made a difference to a disjointed marketplace to become a national network.

The second option was the open application programming interface that enabled any eligible bank, fintech firm, or start-up to develop products on the platform. But instead of the government developing one consumer app that citizens may or may not use, it created the groundwork and let private innovation take off. Various companies like PhonePe, Google Pay and Paytm were fighting a pitched battle to develop attractive, fast and reliable interfaces; the public infrastructure was neutral.

The third option is for security two factor authentication and device binding. All transactions need to be

done with the registered mobile device and a personal identification number, and the actual bank information is concealed behind the virtual address. The fourth is the QR code as a settlement trigger, that eliminated the requirement for costly point-of-sale hardware. A merchant doesn't need a card machine which costs thousands of rupees, just a printed code is sufficient.

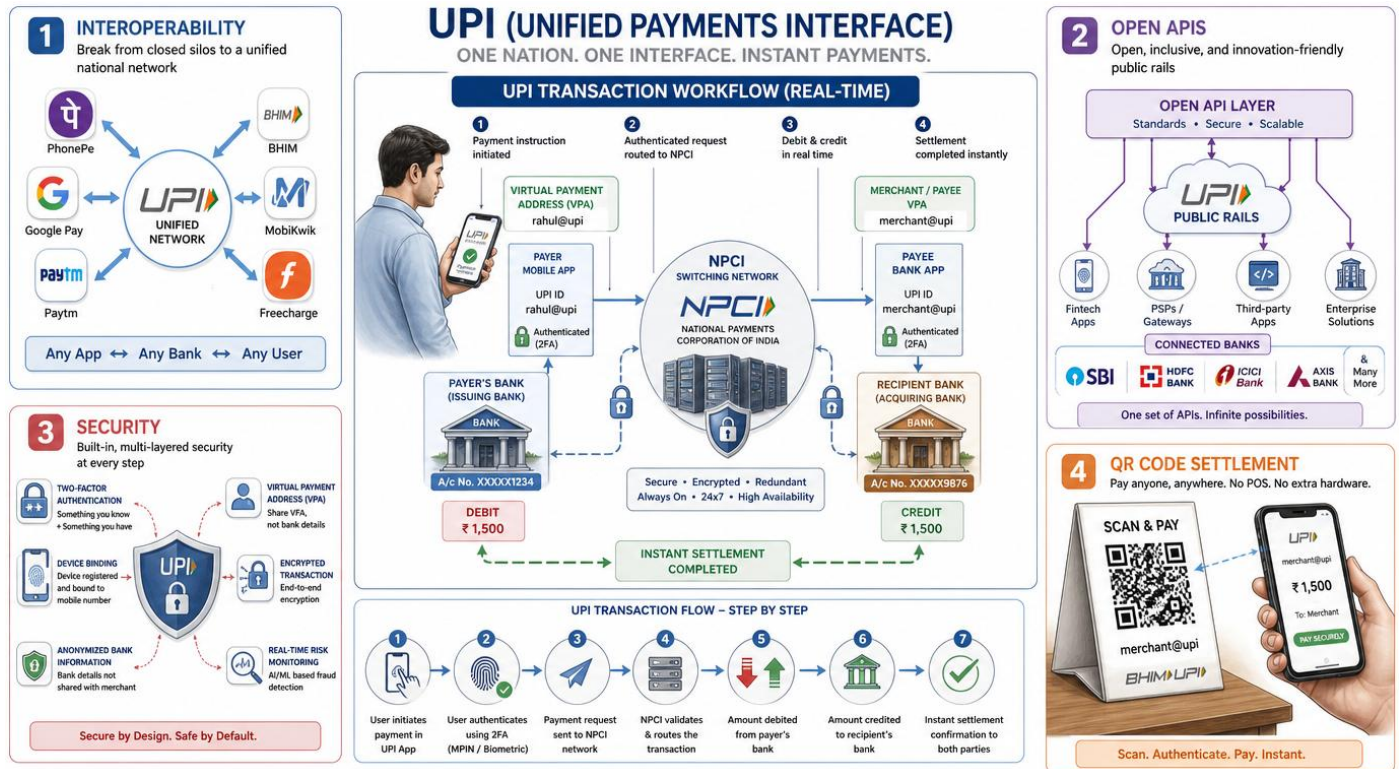


Fig -2: UPI One Nation, One Interface, Instant Payments

The value to the public of this knowledge of architecture is great. The citizens are taught that their funds are never kept in an unregulated holding account but are transferred directly between banks that are supervised. Merchants discover that it doesn't cost them much to be accepted. The broader message one that is relevant to any society is that the creation of shared public infrastructure and the opening of it up for competition above can be a more effective and more equitable way of disseminating a technology than any one proprietary product could be.

5. ENTERPRISE LOGIC AND THE BUSINESS BEHIND IT

It is important to remember the commercial story behind UPI is as much as the technical story, and it's a tension that has not been resolved. UPI's success was in part since it was essentially free for both customers and merchants. For person-to-merchant payments that are less than certain amounts, there is no merchant discount rate, which is the fee that card networks typically levy on a merchant for accepting a payment. This was a complete turnaround for a small trader who used to shun card machines because each swipe cost him money. There was no more cost for acceptance and so there was universal acceptance.

However, this same attribute poses a true business problem. Running a nationwide real-time payment network with seven hundred million transactions a day is a massive and ongoing technology, fraud

prevention, customer service, and resilience investment. When the service does not produce much direct income from the transactions, the issue of who pays for its long-term operation and innovation is crucial. Private applications have always made huge investments to gain users and expected to monetise it in the future by offering other products like lending, insurance distribution, wealth management, and merchant services. In essence, the payment is a loss-leading avenue to a wider financial partnership.

This is where the commercial interest of credit cards comes into the picture. Spending on credit cards has increased while that on debit cards has reduced and spending on UPI against credit lines is up significantly. Credit cards do have a merchant discount rate, which is used to provide rewards, cashback, lounge access, and interest-free credit periods that consumers appreciate. Banks and their affiliates can thus offer attractive incentives on credit products which the fee-free UPI model cannot offer. This is creating a multi-layered market, with low value daily transactions happening on UPI, and high-value or credit-seeking transactions happening on cards, with each having its own commercial use.

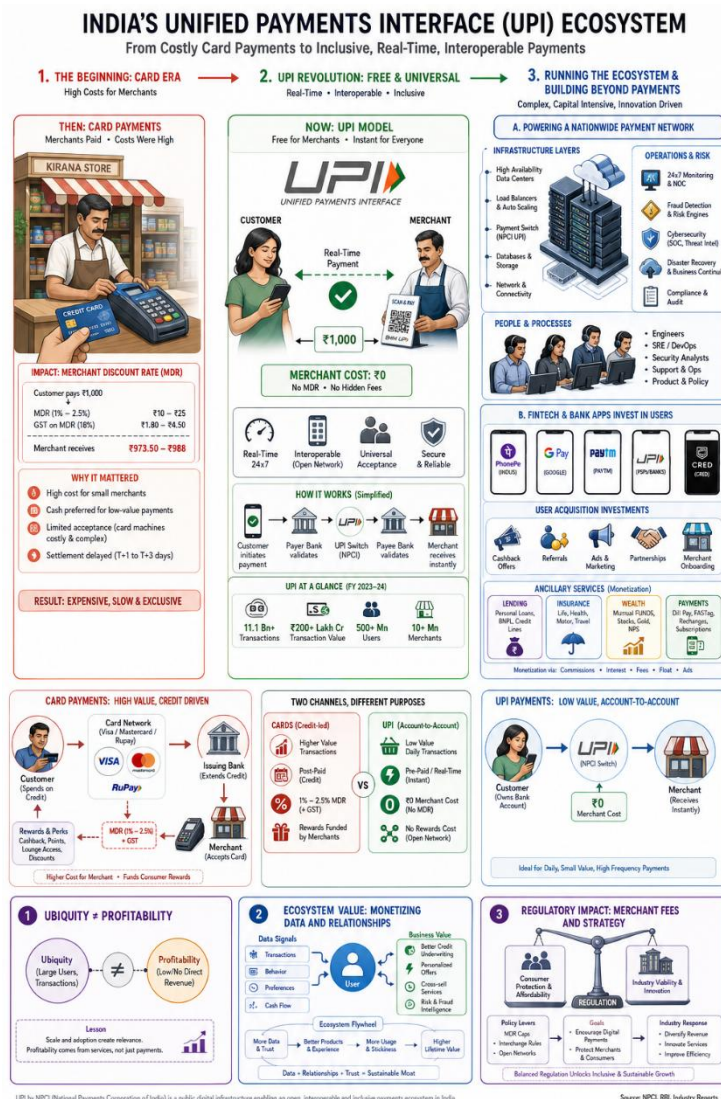


Fig -3: UPI Ecosystems

There are a few lessons to learn for an enterprise watching this market. One is that ubiquity does not

equal profitability, a service can be ubiquitous and still not be profitable. Second is the fact that ecosystems, not products, are increasingly capturing value, with companies monetising the data and relationship made possible by a free payment service. The third is that regulatory decisions, including the determination whether to impose a merchant fee, can have a very strong impact on commercial strategy and may require periodic review to keep the businesses that support critical infrastructure alive. A payment system that society relies on cannot simply be propped up forever on the notion that somebody else will pay for it.

6. ECONOMIC SIGNIFICANCE FOR THE NATION

UPI has far-reaching macroeconomic implications, not just in terms of convenience. This has brought a significant part of the day-to-day economic activity into the formal, recorded financial system, with UPI facilitating the transfer of many small transactions to banks and, in theory, the taxmen. What used to happen in the cash only now happens in the digital realm. This formalization of the economy has the potential to broaden the tax base, provide better economic measurement, and to better target welfare payments and subsidies directly to verified bank accounts.

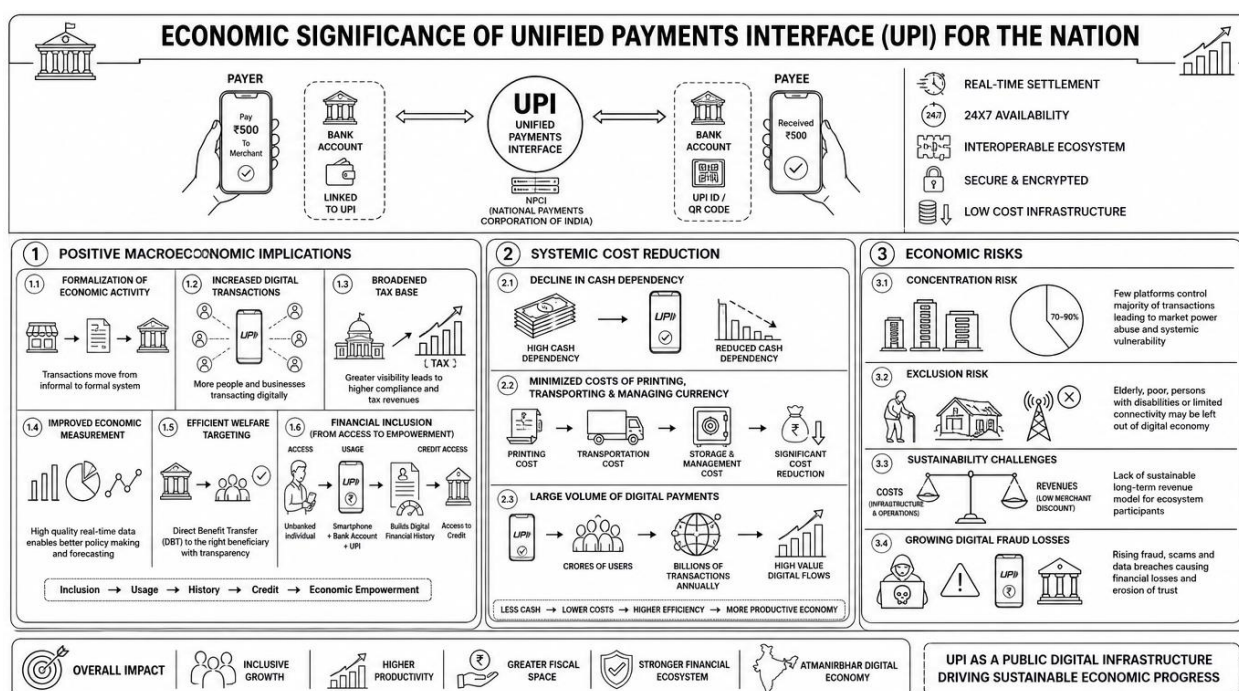


Fig -4: Economic Significance of Unified Payments Interface (UPI) for the Nation

The most popular economic impact is financial inclusion. A person who previously did not have access to formal banking can with a basic bank account and an inexpensive smartphone, do digital commerce, receive payment, and in time develop a financial history. That history can then help them access credit, something that's traditionally been unavailable to those who haven't been documented. This makes the payment network a building block for other financial services to be built on, thereby bringing people who have previously been out of the economic system into the system.

The decrease in cash dependence also decreases some of the systemic costs. The cost of printing, transporting, securing, and replacing physical currency is high, and some of these costs can be

eliminated over time in a society that transacts more digitally. Today, India is one of the largest players in the global real-time digital payments space, a feat that's truly impressive for a cash-heavy nation, the International Monetary Fund noted.

But there are economic risks that must be candidly recognized. If a few applications dominate the market, then a long outage of one of them could result in a large portion of the nation's commerce coming to a standstill. Relying on smartphone ownership and reliable connectivity can leave out the elderly, the very poor and those in areas with poor network coverage and thus can result in a new form of exclusion while the old barriers are dismantled. Without a sustainable revenue model, there is doubt about who will be able to pay for the future resilience of the system. Digital fraud is growing at a fast pace, and the costs of this fraud are real and borne by households, especially households who are least able to detect fraud. The general economic message is that an innovation on this scale of payments is not just a private convenience, but a part of the national economic infrastructure, and therefore has the obligations that come with that. Its advantages are both tangible and significant, but at the same time, the risk of concentration, risk of exclusion and maintenance costs in the long term are not to be underestimated.

7. UPI AS AN INSTRUMENT OF DIPLOMACY AND GLOBAL INFLUENCE

One development that few could have foreseen at the beginning is the use of UPI as a means of international involvement. The system is currently up and running, in different forms and at different levels, in a few countries such as Singapore, France, UAE, Bhutan, Nepal, Sri Lanka, and Mauritius. In various combinations, these arrangements enable Indian travellers to pay overseas using familiar applications, and in some cases, to allow cross-border remittances to be cheaper and faster than through traditional methods. India has also voiced its desire to scale up the model to the grouping of major emerging economies called BRICS.

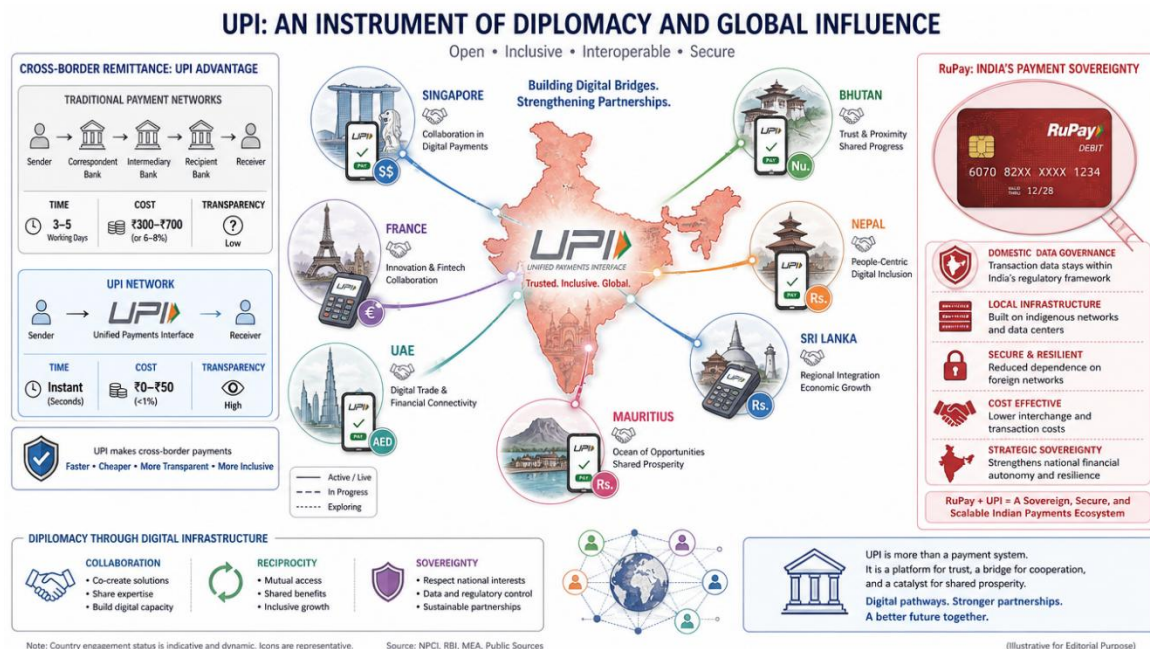


Fig -5: UPI An Instrument of Diplomacy and Global Influence

It is an international expansion that has significance for more than trade. Providing digital public

infrastructure at home to other countries demonstrates technological credibility and establishes long-lasting relations. The goodwill the system has garnered from foreign leaders, including public praise by the French President during his visit to India, is an indicator that India is now seen as a source of financial innovation and not just a recipient. It is a significant change of direction for a country that is used to importing technology, to export a payment standard.

This is related to the issue of payment sovereignty. For decades, India and the world have relied on foreign corporate-owned card networks for its payment system. The RuPay card network, an indigenous card network operated by the National Payments Corporation of India (NPCI), is being promoted along with UPI, indicating a conscious effort to move away from foreign operators and keep the key financial infrastructure within the country. Sovereignty in payments implies that data, rules for transactions and continuity of the payment system are determined domestically and not at the discretion of foreign companies or governments. There are sensitivities to be considered as country states consider the advantages of adopting another country's payment standard versus dependence and data governance. Such partnerships must be sold as collaboration and co-benefit and not as one nation's system being imposed on another for diplomatic prudence. The moral for policy makers is that technological exports are also acts of foreign policy and should be treated with the same care, reciprocity and respect for partners' autonomy that is applied to any foreign policy. If managed carefully, UPI's expansion can help foster India's international relations if managed recklessly, it can cause the very opposition that will hinder adoption.

8. POLICY CHOICES THAT WARRANT RECONSIDERATION

There needs to be a balanced account of the choices and misjudgments of those who have led this change, without rancour but with diplomacy. The point of this is positive: to mark out potential trouble spots in the existing policy that future leaders, regulators and administrators might want to avoid. All these observations are about the design and management of an important public system and not about the character of any individual.

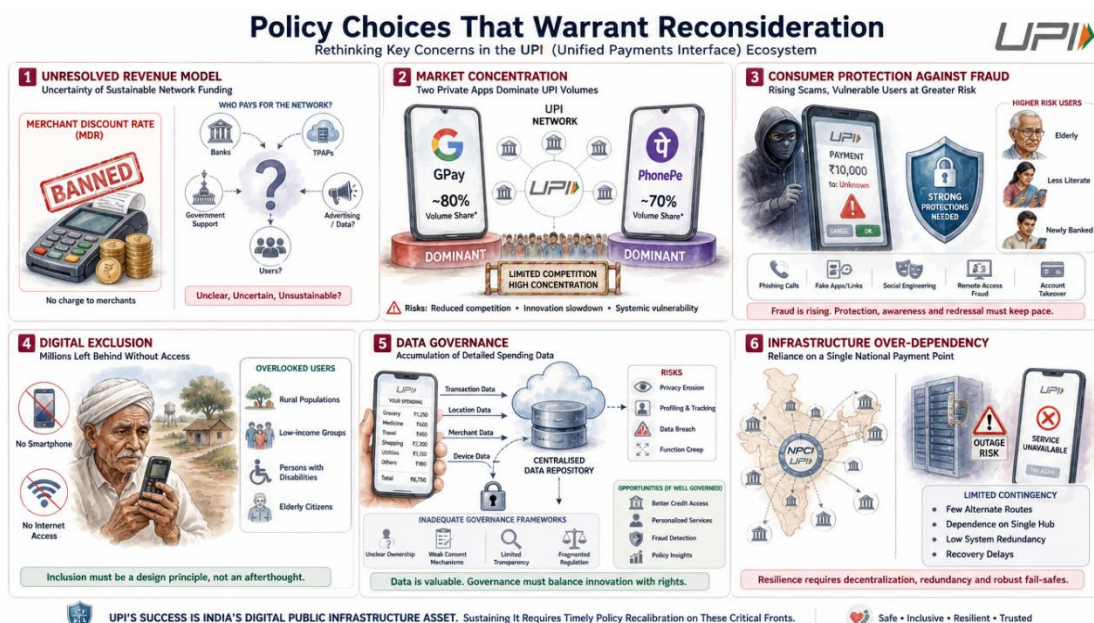


Fig -6: Policy Choices That Warrant Reconsideration



The first, and the most talked about one, is the revenue model that is not resolved. The authorities banned the merchant discount rate for most UPI payments, which helped it gain popularity but with an uncertainty of funding the network. This is a system that's too important to be funded through private subsidy or a temporary government incentive forever it's time for clarity on sustainable funding. Market concentration is the second worry. Two private applications account for the vast majority of UPI volume and while a limit on individual provider market share has been talked about and delayed, meaningful action to ensure resilience and competition has been tardy. Allowing this to continue makes the situation vulnerable, which is why it is better to have a good government when times are normal, not during the emergency.

The third is consumer protection against fraud. Scams have also increased with the rise of adoption, and the elderly, newly banked and less literate are the ones who bear the brunt of it. Public awareness, grievance redress, and the speedy reversal of fraudulent transactions has not been commensurate with the expansion of the system, and this is an avoidable neglect of the most vulnerable users.

The fourth concern is digital exclusion policies that assume that everyone has a smartphone and consistent internet connectivity leave behind people without smartphones and or internet access, and policies have not been sufficiently focused on offline and feature phone payments.

The fifth observation is related to data governance. The opportunity and risk of citizens' detailed records of spending being accumulated creates a comprehensive framework of how this data can be used, which has not been in place, and well-enforced, as the technology it should govern.

The sixth is that there is an over-dependency on a single point of national infrastructure with inadequate contingency planning publicly demonstrated for large scale outages.

The one thing they have in common is that they all tend to focus on adoption numbers and put off the more difficult structural issues of sustainability, competition, consumer protection, inclusion, and data rights. The pitfall that future leaders must not fall into is that as they get successful, they lose the discipline of careful institutional design. But the recognition of an achievement does not mean that unfinished duties should be overlooked; on the contrary, the best way to safeguard this great achievement is to deal squarely and promptly with its shortcomings.

9. THE RESEARCH GAP

The discussions about UPI in the public domain are largely limited to aggregate transactions data and celebratory comments, and this article can only begin to fill the lacunae. The long-term financial sustainability of a fee-free payment model, on a national scale, is not extensively analysed with rigor and independence, nor is the question of who pays the bill for the payment model. Likewise, there is limited empirical work on the distributional impact of the transition and on what it can tell us about the scope and experience of digital inclusion.

The literature on economics has not yet fully measured the connection between the adoption of UPI and the formalizations of small enterprises and the actual formalizations of tax compliance, as opposed to the potential formalization. The behavioural change of consumers shifting their low value spends to UPI and credit-seeking spends to cards is a well-documented phenomenon, but not well researched when it comes to its impact on household debt and saving. Lastly, the diplomatic and geopolitical aspects of the export of a national payment standard are not sufficiently explored, especially in terms of the considerations of efficiency and sovereignty in partner countries. Future research, and particularly



primary transaction data and more extensive field studies, would greatly enhance the evidence base and diminish the importance of the summative data which now dominate the discussion.

10. CONCLUSION

In a nutshell, the changes in Indian payments in the last decade are an incredible feat. After a decade, UPI has become the backbone of the country's economic activity, accounting for over eighty-five per cent of the country's digital transactions and making the debit card obsolete for daily transactions. The country, historically known as one of the cash-dependency countries, is now the leader in real-time digital payment and has started to export its model to other countries. The achievement is based on good design public infrastructure shared among the banks, true interoperability between banks and applications, open competition among private innovators, low merchant costs, and a security model that put users in control and eliminated friction. It is knowledge that is relevant for any society wanting to develop digital public goods. But a thorough and honest evaluation should consider this achievement as well as its unfinished business. How the system will be paid for in the long term is yet to be determined. Market concentration into a few applications makes the market vulnerable, and prudent governance has been tardy in addressing this vulnerability. Fraud has been expanding quicker than the measures designed to limit it, and it has been the poorest who have been hit the hardest. The system excludes citizens who don't have a smartphone or good connectivity, and the law that regulates the huge amount of personal data it produces has not caught up with technology. None of these fears detracts from what has been created but rather is an additional reason to be careful.

The broader takeaway for future leaders, regulators and enterprises is that when popular success is going well, it's easy for institutions to put off tough structural decisions. The discipline to maintain an achievement is different from and often less glamorous than the energy to achieve it. Whether India's payment revolution will be a success will not only depend on its rate of growth, but also on the wisdom of its custodians in dealing with sustainability, competition, consumer protection, inclusion, and data rights in the coming years. The lesson for the average reader is reassuring and cautionary. The system which enables the daily scanning of QR codes is robust, regulated and truly transformative, and has integrated millions of people into the formal economy who were previously excluded. It also cannot be spared for the informed scrutiny of the citizens who rely on it. Such significant technology should not only be the property of the institutions that created it, but of the society that utilizes it, and society is best served by knowing both its capabilities and what needs to be done.

REFERENCES

- [1] Banga, S., & Singh, P. (2026). Digital literacy as a catalyst for mobile payment marketing effectiveness. Impacts of Digital Payment Systems on Marketing. <https://doi.org/10.4018/979-8-3373-4526-0.ch002>
- [2] Bhoot, M. (2025). A comparative study on growth of UPI over debit card transactions in India. *International Journal of Science and Research (IJSR)*, 14(2), 237-241. <https://doi.org/10.21275/sr25124112037>
- [3] IMF. Statistics Dept. (2012). IMF committee on balance of payments statistics, annual report 2011. <https://doi.org/10.5089/9781475503630.044>
- [4] Invali, S. (2025). Digital payment patterns in India: A cross-sectional study of credit cards, debit cards, and unified payments interface (UPI) trends. *Cureus Journal of Business and Economics*. <https://doi.org/10.7759/s44404-025-04075-7>



- [5] Patidar, A., Chavda, D., & Prasannan, D. S. (2026). Adoption of UPI and digital wallets among small merchants in vadodara city. *Kaav International Journal of Economics , Commerce & Business Management*. <https://doi.org/10.52458/23484969.2026.v13.iss2.kp.a20>
- [6] Rani, R., Alam, A., & Javed, A. (2024). Secure UPI: Machine learning-driven fraud detection system for UPI transactions. 2024 2nd International Conference on Disruptive Technologies (ICDT). <https://doi.org/10.1109/icdt61202.2024.10489682>
- [7] Sahu, A. K., Sahu, D., & Patra, D. (2023). An empirical study of unified payment interface (UPI) in indian digital payment system. *Parikalpana: KIIT Journal of Management*, 19(2), 236. <https://doi.org/10.23862/kiit-parikalpana/2023/v19/i2/223477>
- [8] Samundeeswari, D. S., & Subalakshmi, M. K. (2026). A study on customer satisfaction of using UPI apps transaction payments. *International Journal of Research Publication and Reviews*, 7(2), 767-773. <https://doi.org/10.55248/gengpi.07.0226.0243>
- [9] x, S. (2024). Unified payment interface (UPI): A digital transformation in india. *International Journal of Science and Research (IJSR)*, 13(11), 1727-1731. <https://doi.org/10.21275/sr241119155237>
- [10] Yingli, L. (2021). Design and implementation of QR code payment in power self-service payment terminal. 2021 6th International Symposium on Computer and Information Processing Technology (ISCIPIT). <https://doi.org/10.1109/iscipit53667.2021.00093>
- [11] George, D. (2025c). Data centers and water crisis in India: Why digital infrastructure could drain our wells dry by 2030. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.17920097>
- [12] (2022). Payment systems. *Modeling Monetary Economies*. <https://doi.org/10.1017/9781009099639.016>
- [13] George, D. (2025b). Digital Watermarking in Cloud Environments for Copyright Protection: A Comprehensive review. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.17726895>
- [14] Adamo, R., Federico, D., & Notte, A. (2024). Financial inclusion literature review. *Advances in Finance, Accounting, and Economics*. <https://doi.org/10.4018/979-8-3693-0522-5.ch003>
- [15] George, D. (2025a). Beyond the dashboard critical perspectives on digital employee monitoring and the paradox of productivity measurement in contemporary organizations. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.17702042>
- [16] Agarwal, R. K., & Das, D. D. K. (2023). UNIFIED PAYMENTS INTERFACE (UPI) REVOLUTION: TRANSFORMING DIGITAL PAYMENTS IN INDIA. *IIP Series*. <https://doi.org/10.58532/v3bhma2p3ch4>
- [17] George, D. (2024). Finance 4.0: The transformation of financial services in the Digital Age. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.11666694>
- [18] Kothapalli. Mandakini, E. A. (2023). Ensemble learning for fraud detection in online payment system. *International Journal on Recent and Innovation Trends in Computing and Communication*, 11(10), 1070-1076. <https://doi.org/10.17762/ijritcc.v11i10.8626>
- [19] George, D. (2026a). Digital dividend data taxation's potential to transform India's economy and redefine fiscal policy in the mobile era. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.19021896>
- [20] George, D., Dr.T.Baskar, & Dr.M.M.Karthikeyan. (2026). The Grammar of Icons: decoding the origins, meanings, and cognitive power of everyday digital and cultural symbols. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.19959167>
- [21] Lakhotia, K. (2024). Revolutionizing digital payments and transforming global economies: A drive promoting cashless market scenarios. *International Journal of Science and Research (IJSR)*, 13(4), 581-595. <https://doi.org/10.21275/sr24406144130>
- [22] George, D., George, A., Dr.T.Baskar, & Pandey, D. (2026). Digital Dependency and Temporal Distortion: A Critical review of smartphone use, cognitive impact, and Behavioral intervention in Post-Pandemic Society. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.19864919>
- [23] Rambe, P. (2024). Digital payments for deepening financial inclusion and democratising financial ecosystems in africa. *Blockchain, Metaverse, and Digital Payments*. <https://doi.org/10.4324/9781003401452-18>
- [24] George, D., George, A., Dr.T.Baskar, & Martin, A. (2023). An overview of India's Unified Payments Interface (UPI): benefits, challenges, and opportunities. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.7723154>
- [25] Szcurek, M. (2003). International liquidity and currency crisis costs. *Currency Crises in Emerging Markets*. https://doi.org/10.1007/978-1-4615-0343-9_3
- [26] George, D., & George, A. (2025). How artificial intelligence systems function as digital migrants creating more profound societal disruption than human immigration. Zenodo (CERN European



- Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.16112307>
- [27] Thukral, A., & Dagar, L. (2025). India's digital public infrastructure: Analyzing UPI and aadhaar in GDP growth and cost optimization. *Journal of Emerging Investigators*. <https://doi.org/10.59720/25-046>
- [28] George, D., Dr.T.Baskar, & Siranchuk, D. (2026). Digital Addiction in Children: economic impact, global age restrictions, and protective solutions. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.18818134>
- [29] Viard, A. D. (2009). Two cheers for corporate tax base broadening. *National Tax Journal*, 62(3), 399-412. <https://doi.org/10.17310/ntj.2009.3.03>
- [30] George, D. (2026b). Digital Inclusion vs. Fiscal Revenue Assessing India's Per-Gigabyte Data Tax. Zenodo (CERN European Organization for Nuclear Research). <https://doi.org/10.5281/zenodo.20922074>
- [31] S., V., Dash, S., Chadha, V., & D. Nankani, V. (2019). Rupay: The emergence of an indian card giant (A marketing perspective). *International Journal of Scientific and Research Publications (IJSRP)*, 9(2), p8667. <https://doi.org/10.29322/ijsrp.9.02.2019.p8667>
- [32] Aarthy, D. J., & Madan, S. S. (2026). A study on consumer awareness and protection behaviour towards UPI payment services in india. *International Journal of Research Publication and Reviews*, 7(5), 1918-1920. <https://doi.org/10.55248/gengpi.07.0526.c1140>
- [33] Goel, A. (2025). The impact of UPI on micro and small-scale enterprises (mses) in india: Opportunities, challenges, and future prospects. *International Journal of Social Science and Economic Research*, 10(08), 3469-3493. <https://doi.org/10.46609/ijsser.2025.v10i08.027>
- [34] Haque, M. I., N.P., A. A., & Akhtar, S. J. (2025). UPI and financial inclusion in rural india: A case study. *Development and Sustainability in Economics and Finance*, 6, 100056. <https://doi.org/10.1016/j.dsef.2025.100056>
- [35] Kosasih, A. (2016). Inter-religion harmony. *Proceedings of the 1st UPI International Conference on Sociology Education (UPI ICSE 2015)*. <https://doi.org/10.2991/icse-15.2016.1>
- [36] Ranteallo, I. C., & Andilolo, I. R. (2016). Share what and how you cook at home!: Uncovering social identity. *Proceedings of the 1st UPI International Conference on Sociology Education (UPI ICSE 2015)*. <https://doi.org/10.2991/icse-15.2016.63>
- [37] Singh, T. (2026). How digital companies contribute to digital exclusion. *Digital Exclusion and the Digital Divide*. https://doi.org/10.1007/978-3-032-15290-9_5
- [38] X, S. (2024). Unified payment interface (UPI): A digital transformation in india. *International Journal of Science and Research (IJSR)*, 13(11), 1727-1731. <https://doi.org/10.21275/sr241119155237>
- [39] (2026). UPI adoption and its role in advancing financial inclusion. *European Economic Letters (EEL)*. <https://doi.org/10.52783/eel.v16i1.4345>
- [40] (2026). Digital personal data protection in india: Examining the tension between state surveillance and informational privacy. *Journal of European Economic History*, 7(2), 521-537. <https://doi.org/10.61336/jeeh/26-2-41>