



# Optimizing Digital Transactions: A Look At Challenges And Best Practices For Unified Payment Interfaces

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**Abstract:** The digital revolution has transformed the way we transact financial transactions. With smart phones and internet connectivity rising, mobile payment systems such as UPI have become increasingly popular. Developed by NPCI, UPI is an instant money transfer and payment system that allows users to make instant payments using their smartphones. However, the platform's widespread adoption and effective use come with a number of challenges. This paper systematically examines the challenges faced in the UPI domain. From security concerns to interoperability issues, user awareness issues, and technological limitations, the paper examines the best practices for optimizing UPI usage, focusing strongly on user education, strong security measures, smooth interoperability, and continuous technology development. This paper aims to provide stakeholders with valuable guidance on how to use UPI more efficiently and securely, leading to a better overall digital transaction experience.

## I. INTRODUCTION

The digital revolution has profoundly impacted the way we conduct financial transactions. With the rise of smartphones and internet connectivity, mobile-based payment systems like Unified Payment Interfaces (UPI) have gained immense popularity. Unified Payments Interface (UPI) is a real-time payment system developed by the National Payments Corporation of India (NPCI) [21]. Digital payment transactions in India have seen significant growth in recent years, primarily driven by government initiatives, increased smartphone penetration, and the push towards a cashless economy (Figure 1). The growth of digital payments in India reflects a fundamental shift in how financial transactions are conducted [4]. It has made financial services more accessible, convenient, and efficient for a wide range of users, contributing to the country's goal of financial inclusion and a cashless economy.

UPI provides an easy way to transfer funds between bank accounts. Multiple bank accounts can also be added to a single UPI application. UPI transactions can be done through UPI ID, Mobile number, and Bank account number with IFSC. UPI has become India's preferred payment method. According to the data released by NPCI, UPI transactions made a record 6.8 billion transactions, amounting to 11.16 trillion in September 2022 [5].



Note\*: Data till 31st December 2022  
 Exchange rate as in February 2023 i.e., Rs. 1 = US\$ 0.012  
 Source: Press Information Bureau

Figure 1. Overview of Digital Transactions

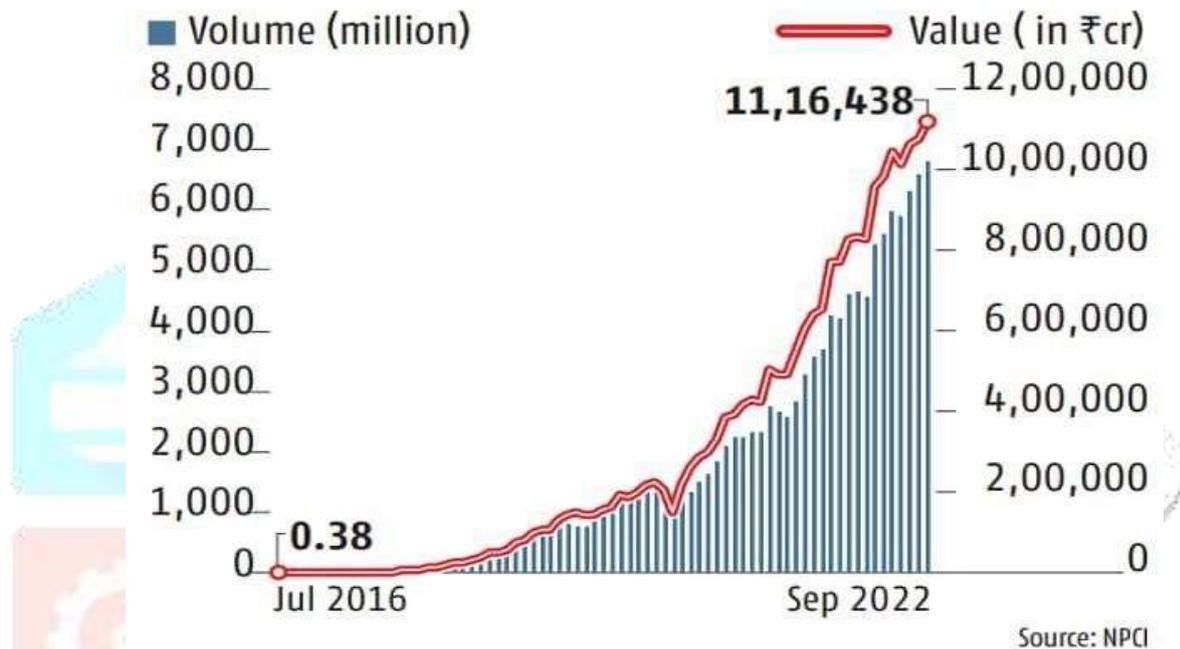


Figure 2. Growth of UPI Transactions

UPI is a user-friendly platform that ensures easy transactions for anyone with a smartphone and internet access. It offers 24/7 operation, promoting flexibility beyond traditional banking hours and allowing real-time money transfers, making it invaluable for emergencies and time-sensitive transactions. UPI's broad acceptance by various merchants, from street vendors to e-commerce sites, has significantly reduced cash reliance in India. Furthermore, UPI has improved accessibility to banking and financial services, including remote and underserved areas, supporting the government's financial inclusion initiatives. It provides secure transactions authenticated by UPI PIN or biometric verification, reducing cash-related risks. UPI is also used for international remittances, facilitating transfers from family members abroad.

Despite its advantages, UPI has challenges. It faces phishing attacks, potential downtime, transaction failures, internet dependence, device compatibility issues, privacy concerns, and variations in UPI apps from different providers. Resolving transaction issues can be challenging, and customer support may not always be efficient. To address these challenges, regulators and service providers work to enhance UPI's security, efficiency, and accessibility. Users should also take precautions and stay vigilant

## II. OVERVIEW OF UNIFIED PAYMENT INTERFACE(UPI)

The UPI ecosystem includes payment service providers (PSPs), customer banks, third-party applications (TPAPs), and prepaid payment instruments (PPIs). It enables quick fund transfers between bank accounts via mobile platforms. UPI allows users to connect multiple bank accounts in one mobile app, offering a convenient and efficient way to transact. In India, NPCI created the UPI app BHIM in 2016. Many other popular third-party UPI apps, like GPay, PhonePe, Paytm, etc., are also being used. The UPI works on a four-pillar architecture:

- a) **Immediate Payment Service (IMPS):** IMPS is a real-time inter-bank electronic fund transfer system that facilitates instant funds transfer between two bank accounts.
- b) **Aadhaar Payment Bridge System (APBS):** APBS is a payment system that enables bank account holders to make financial transactions using their Aadhaar number.
- c) **Account Aggregator (AA):** AA is a digital platform that allows customers to securely and controllably share their financial data with authorized third-party financial service providers.
- d) **UPI Application Programming Interface (API):** UPI API is a set of technical specifications that enables developers to build applications using the UPI payment system.

UPI payments are accessible through mobile apps like Google Pay, Paytm, PhonePe, and BHIM. Users must have a unique UPI ID linked to their bank account to make UPI payments. With a UPI ID, users can transfer funds by entering the recipient's UPI ID and the amount. To use UPI payments, users must register on the app with their unique Virtual Payment Address (VPA) and link it to their bank accounts. The VPA is a distinctive user address exclusively for financial transactions. The following steps are carried out to use the UPI.

- **Setup:** To use UPI, you need a bank account with a bank that supports UPI and a smartphone with an internet connection.
- **Registration:** After installing the app, you'll need to link your bank account to the app. This typically involves selecting your bank, providing your account number, and verifying your identity through your mobile number and a one-time password (OTP).
- **Creating a UPI ID:** Once your bank account is linked, you'll create a UPI ID (also known as a Virtual Payment Address or VPA). This ID is a unique identifier that looks like an email address (e.g., yourname@bankname). You can share this UPI ID with others instead of your bank account number and IFSC code to make payments.
- **Making Payments:**
  - a. **Send Money:** To send money to someone, select the "Send Money" or "Send Payment" option within the UPI app. Enter the recipient's UPI ID or mobile number, the amount you want to send, and a reference note (optional).
  - b. **Verify Transaction:** Before the transaction is completed, you'll need to confirm the payment details and enter a UPI PIN, a 4-6-digit security code you set when you link your bank account. This PIN ensures that only you can authorize transactions from your bank account.
  - c. **Transaction Notification:** Once the payment is successful, the sender and recipient receive instant notifications confirming the transaction. The money is transferred in real-time between their bank accounts.
- **Request Money:** You can also use UPI to request money from someone. You enter the amount you want to request, the person's UPI ID or mobile number, and a note if necessary. The recipient will receive a notification and can approve or decline the request.
- **Checking Balance:** UPI apps often allow you to check your bank account balance and view transaction history.
- **Other UPI Services:** UPI offers various other services like bill payments, mobile recharge, booking tickets, and more, depending on the specific UPI app you're using.

- **Security:** UPI is considered secure because it uses two-factor authentication (your mobile number and UPI PIN) for transactions. Additionally, it's regulated by the Reserve Bank of India (RBI) and follows strict security guidelines.

UPI offers features like balance checks, bill payments, transaction history, notifications, and account management. The user initiates transactions by entering the payee's VPA and bank account details or scanning a QR code (Figure 3). The payer's PSP sends the request to UPI/NPCI, which verifies the payee's VPA. UPI/NPCI then retrieves the payee's bank details, debits the payer's account, and credits the payee's account through the bank. Transaction status is updated in the payer's UPI app. Many UPI apps don't impose transaction charges or daily limits. In the retail market, customers can make cashless purchases using UPI, and collaborations with e-commerce sites and service providers offer customers cashback and discounts.

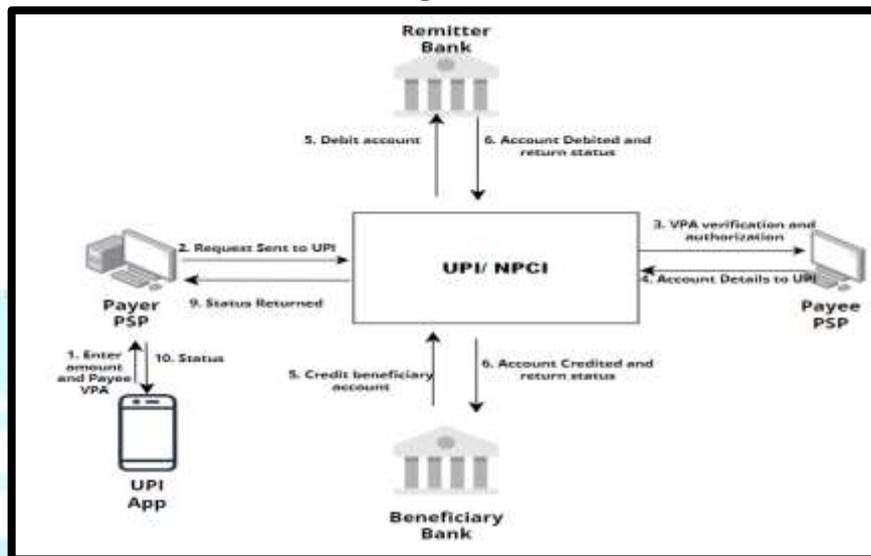


Figure 3. UPI Transaction Process

### III. REVIEW OF LITERATURE AND RELATED WORKS

In recent years, several studies have been conducted to understand the growth and impact of the Unified Payment Interface (UPI) in India. The following studies provide insights into UPI usages, challenges, and issues.

Bijin Philip (2019). This study focused on customer preferences for integrated payment interfaces and the impact of UPI on customer satisfaction. The researcher used f-tests, ANOVA, and regression analysis to analyze and interpret data. The study stated a positive attitude towards UPI, and educated people prefer UPI services more [7].

Ahuja, P., & Nanda, S. (2021). This study aimed to understand UPI's growth and progression in retail digital payment in recent years. SWOT analysis was applied to the secondary source data. The study reveals that digital payments have increased in the retail payment sector on the UPI platform in the last two years [6].

Ritu Vij (2023). This study delves into the role of UPI in Financial inclusion. It focuses on an underprivileged class of society's accessibility to banking services and the government's hurdles in financial inclusion, even with UPI. The study discusses challenges like poor internet connectivity, online transactions, and the efforts made by the government to reach youngsters [13].

The paper "Digital Payments Transformation in India: Trends, Issues, and Opportunities" by Dhore, Anupkumar, Joshi, Vijay, and Baral, Sukanta (2023) provides insights into the evolving landscape of payment systems, including the emergence of UPI payments as a key trend. It is essential to consult the specific paper mentioned to understand the concept of UPI payments and how they fit into the evolving payment landscape [8].

The paper "Security in Next Generation Mobile Payment Systems: A Comprehensive Survey" by W. Ahmed et al. (2021) explores diverse mobile payment system (MPS) models, their technologies, payment methods, and security mechanisms. It includes encryption technologies, authentication methods, and security models for mobile phones and various MPS, such as near-field communication, QR codes, radio frequency identification, Bluetooth, SMS, the universal second factor, and their corresponding security measures. The paper discusses various factors affecting mobile payment systems, including socioeconomic conditions, mobile phone diffusion, cost-effectiveness, convenience, security issues, ecosystem development, restrictions, and collaboration. Encryption in MPS involves symmetric and public key encryption, and the paper also addresses cyber-attacks on mobile payment systems, like PIN theft, brute force attacks, and attacks on MMS traffic and servers [9].

In their 2020 paper "Electronic Payment Schemes Based on Blockchain in Vents," X. Deng and T. Gao conducted a comprehensive survey of Blockchain-based payment systems. They cover Blockchain technology's characteristics, like decentralization, immutability, and transparency. The paper explores Blockchain-based payment systems, including cryptocurrency-based, smart contract-based, and cross-border payment systems. [10].

The research paper "The Emerging Technologies of Digital Payments and Associated Challenges: A Systematic Literature Review" provides a comprehensive literature review on emerging digital payment technologies and associated challenges. While it does not explicitly focus on UPI, it may offer insights into the challenges and potential mitigations for UPI payment issues. The paper discusses various challenges of digital payment technologies, including security, privacy, fraud, and technical glitches. It also highlights the importance of financial inclusion and the role of government in enhancing digital transformation in small service businesses [11].

Another article, "Digital payments: How to resolve failed UPI payments, mitigate risks, and ensure smooth transactions," provides suggestions for resolving failed UPI payments and ensuring smooth transactions. It emphasizes the importance of real-time transaction status checks, error code interpretation, retry mechanisms, intelligent customer support integration, and user-friendly interfaces in mitigating UPI payment issues [12].

J. Narayanan (2021), A Study on Growth of UPI Apps in India after Covid Outbreak. This research paper studies the concept of UPI, the impact of UPI, the growth due to the COVID-19 pandemic, and the challenges of UPI apps. The study says that UPI apps' growth contributed more to the development of many Fintech and start-up companies in post-2020 to record the payment system of 2 billion transactions in a month. The paper also suggests focusing on the required infrastructure for large-scale growth with minimal technical failures [22].

These studies provide valuable insights into the impact of UPI on customer satisfaction, retail digital payments, and financial inclusion. The studies reveal that UPI positively impacts customer satisfaction and has contributed to the growth of digital payments in the retail sector. However, challenges remain to be addressed, such as poor internet connectivity and online transactions, to ensure financial inclusion for all.

#### **IV. CHALLENGES IN UPI IMPLEMENTATION AND USAGES**

The Unified Payments Interface (UPI) has become a widely used digital payment system in India but has its issues and challenges. A detailed list of the issues and challenges associated with using the UPI payment system in India:

##### **4.1 SECURITY CONCERNS**

One of the top concerns with UPI is security. Many fraudsters create deceptive handles with names like NPCI, UPI, BHIM, etc., to make individuals reveal their account details. A security analysis of the UPI protocol revealed previously unreported multi-factor authentication design-level flaws in the UPI 1.0 specification that can lead to significant attacks when combined with an installed attacker-controlled

application [14]. In an extreme version of the attack, the flaws could allow a victim's bank account to be linked and emptied, even if a victim had never used a UPI app. The potential attacks were scalable and could be done remotely. Cybercriminals use phishing, vishing, or smishing to deceive customers, entice them to reveal their sensitive information, and create financial losses (Figure 4). UPI transactions are vulnerable to phishing attacks, fake UPI collect requests, and fraudulent transactions, which can lead to financial losses [3]. Storing and transmitting personal and financial information through UPI can raise concerns about privacy and security. Handling fraud detection and dispute resolution for UPI transactions can be a challenge. It's essential to establish robust mechanisms for identifying and resolving fraudulent transactions.

As the UPI transactions escalated tremendously, the security attacks also rose on par with the usages. According to research and analysis conducted [16], the following attacks are listed with various users of UPI.

- Unauthorized registration, given a victim's cell number.
- Overcoming passcodes.
- Unauthorized transactions on bank accounts given cell number and partial debit card number.
- Unauthorized transactions without debit card numbers.
- Misleading UPI handles
- Request Money Fraud
- Remote screen monitoring frauds
- SIM Cloning etc

Year	Number of UPI Frauds	Amount Lost (in INR)
2021	8,101	137.47 crore
2022	12,563	200.62 crore
2023 (YTD)	9,321	162.34 crore

**Figure 4. Financial Losses Due to UPI Frauds**

**Source: National Crime Records Bureau (NCRB) – 2023 [21]**

## 4.2 NETWORK CONNECTIVITY AND FAILURES

UPI relies on internet connectivity, which can be unreliable in many parts of mainly rural areas. Poor connectivity can limit access to UPI services. UPI transactions can fail for various reasons, including incorrect details, server issues, or insufficient funds. Transaction failures can be frustrating for users. UPI systems can experience network congestion during peak usage, leading to slower transaction processing or temporary unavailability [15]. Poor or unstable internet connections can result in payment failures or delays. UPI transactions can fail due to incorrect details entered, server-side errors, or even a simple lack of funds in the account. Technical glitches within the UPI system itself can lead to payment failures.

## 4.3 INTEROPERABILITY ISSUES

Not all banks and financial institutions in India support UPI. This can lead to interoperability issues, making it difficult for users of non-participating banks to transact with those using UPI. Varying technology standards and integration complexities can hinder the achievement of true interoperability [20]. This can

result in compatibility issues and hinder the smooth user experience. Interoperability issues can arise when different banks and payment service providers use different technology standards. Lack of standardization in the payment ecosystem can lead to interoperability issues. The absence of a common language for communication between different payment systems can lead to interoperability issues. The lack of a common standard for QR codes can lead to interoperability issues.

#### **4.4 Complex Registration Process**

Registering for UPI payments can be challenging for certain users due to its multifaceted nature. It necessitates linking a bank account and the establishment of a UPI PIN and often involves mobile number verification, which can be problematic for individuals who are less familiar with technology [22]. Registering for UPI payments can indeed be intricate and time-consuming. To get started with UPI, users need to download a mobile app that supports UPI from their respective bank or a third-party provider. The registration process typically involves inputting their mobile number, generating a unique UPI ID (Virtual Payment Address or VPA), and connecting their bank account(s) to the UPI app. Several common challenges associated with the intricate registration process in UPI payments include KYC Requirements, Technical Challenges, dealing with Multiple Apps and Banks, Forgetting PINs and Passwords, Lack of Standardization, Connectivity Issues, Aadhaar Verification, Delays in Document Verification, and Language Barriers.

#### **4.5 LIMITED MERCHANT ACCEPTANCE AND TRANSACTION LIMITS**

Despite the growing popularity of UPI payments, not all merchants accept UPI payments. This can limit the convenience of using UPI for transactions. Many small merchants, especially in rural areas, may not have the necessary infrastructure to accept UPI payments. They may rely on traditional cash-based transactions, limiting UPI's reach in these regions. Some merchants, particularly in remote areas, may not know UPI or fully understand how to accept payments. This lack of awareness can hinder adoption. UPI transactions are subject to daily and monthly limits imposed by banks. While these limits are in place for security reasons, they can be restrictive for individuals or businesses that need to make larger payments. UPI transactions are also subject to per-transaction limits, hindering high-value transactions. Users may need to resort to other payment methods for larger payments. UPI payments' transaction limit is Rs. 1 lakh per transaction. However, the maximum limit can change from bank to bank. Some banks have also set UPI transfer limits per week or month instead of a day. This can limit the amount of money that can be transferred via UPI.

#### **4.6 REGULATORY AND COMPLIANCE CHALLENGES**

Compliance with evolving regulations is complex for UPI service providers and users, especially in data protection, privacy, and anti-money laundering laws. Adherence to these regulations is vital for the security and integrity of UPI transactions. Achieving true interoperability among banks and payment service providers is challenging due to varying technology standards and integration complexities, potentially leading to compatibility issues and impacting the user experience. Protecting user data is paramount, given UPI's involvement in collecting and processing personal and financial information. This involves compliance with data protection laws like the GDPR in Europe and India's data protection regulations. Ensuring privacy and security in UPI transactions can be intricate. Regulators must enforce these standards across all banks and financial institutions to maintain a seamless user experience. Regulatory compliance is essential for merchants onboarding to prevent money laundering and illicit activities. However, streamlining this process while ensuring compliance can pose challenges.

## 4.7 LACK OF AWARENESS

UPI is a robust digital payment system in India, but many individuals, especially in rural and less tech-savvy demographics, may lack awareness of its capabilities. UPI apps and instructions are often available in English or other widely used languages, which can pose challenges for users more comfortable with regional languages. Limited training and education on UPI usage can discourage adoption, especially in rural areas. Awareness levels differ significantly between urban and rural areas, where internet access can be unreliable, leading to skepticism about UPI's security features and concerns about fraud. Some merchants may not be aware of or have adopted UPI, limiting its usability. Additionally, ingrained habits and a preference for cash transactions can make some users resistant to switching to UPI despite its benefits and convenience.

## 4.8 POLICY AND REGULATORY CHANGES

Frequent policy changes in the UPI ecosystem require adaptation by businesses and users. These changes address evolving financial needs but can introduce challenges. Mandating interoperability among UPI providers improves the user experience but can lead to transitional issues. Data localization requirements raise compliance and cost concerns. Data privacy regulations increase compliance burdens for service providers and may limit data use for service improvement. Stricter security and anti-fraud rules require significant investments. Introducing recurring payments is positive but raises concerns about customer control. Merchant onboarding regulations prevent fraud but can be administratively complex, causing delays. Compliance reporting to regulatory authorities is resource-intensive. Cross-border UPI regulations add complexity, and consumer protection policies lead to disputes. The evolving digital payment landscape requires regular policy updates, introducing uncertainty.

## V. MITIGATION MEASURES AND BEST PRACTICES FOR ENHANCING THE DIGITAL TRANSACTIONS

Addressing UPI payment transactions' challenges, concerns, and issues involves collaboration among banks, payment service providers, regulatory bodies, and users. Regular monitoring and adaptation to emerging threats and challenges are crucial to maintaining the security and reliability of UPI payments. Additionally, evolving technology and regulations should be considered to avoid potential issues in the digital payment landscape. Individual issues, challenges, mitigations, and best practices for using this technology are given below.

### 5.1 SECURITY SOLUTIONS AND BEST PRACTICES

Security is paramount in UPI (Unified Payments Interface) payments to protect users and their financial transactions. The users must,

- a) Enforce Two-Factor Authentication (2FA) for all UPI transactions, typically requiring users to enter a one-time password (OTP) sent to their registered mobile number or use biometric verification.
- b) Encourage users to set strong UPI PINs and change them regularly. Avoid easily guessable PINs like birthdates or sequential numbers.
- c) Promote biometric authentication, such as fingerprint or facial recognition, for an extra layer of security.
- d) Keep UPI apps and systems up to date to address security vulnerabilities and ensure the latest security features are in place.
- e) Ensure user data is encrypted during transmission and storage to protect it from unauthorized access.
- f) Implement robust consent mechanisms to give users control over their data and transactions. Users should be asked for permission before data sharing or transactions occur.

- g) Utilize advanced fraud detection algorithms powered by AI and machine learning to monitor transaction patterns and identify anomalies or potentially fraudulent activity.
- h) Provide accessible and efficient customer support to help users resolve transaction disputes, report fraud, or address any issues.
- i) Maintaining detailed transaction records for users to review and verify past transactions facilitates dispute resolution.
- j) Conduct ongoing security awareness campaigns to educate users about common phishing tactics and how to recognize and avoid them.
- k) Ensure UPI PINs are securely entered using virtual keyboards or masked PIN entry to prevent shoulder surfing.
- l) Encourage users to keep their mobile devices secure with lock screens and updated operating systems to protect UPI app access.
- m) Continuously monitor and adhere to the regulatory guidelines set by authorities to ensure that UPI systems are safe and compliant.

These solutions and best practices are essential for safeguarding UPI payments and maintaining user trust in the system. By implementing these security solutions and best practices, users can significantly minimize the risks associated with UPI transactions. A combination of user education, robust technological measures, and regulatory compliance is necessary to address the evolving challenges in UPI payment security.

## 5.2 NETWORK CONNECTIVITY AND FAILURES HANDLING

Network connectivity and failure handling are critical to ensuring the reliability and robustness of UPI (Unified Payments Interface) transactions. UPI heavily depends on network communication, and any disruption can lead to transaction failures or delays. The UPI providers, companies, and users must adapt and practice the following.

- a) Implementing redundant connections and load balancing.
- b) Continuous real-time monitoring of network and system health.
- c) Developing fall-back mechanisms for handling network failures.
- d) Allowing limited offline transactions during network issues.
- e) Setting reasonable transaction timeouts.
- f) Employing transaction queues for reprocessing.
- g) Creating robust error-handling mechanisms.
- h) Keeping users informed about transaction status.
- i) Regularly testing network failure scenarios.
- j) Utilizing backup connectivity options.
- k) Continuously improving network connectivity and failure handling.

These practices ensure transaction integrity and a smooth user experience, even during network disruptions.

## 5.3 INTEROPERABILITY MANAGEMENT

Interoperability in UPI (Unified Payments Interface) is crucial for different providers to work together seamlessly, allowing cross-platform payments. UPI's security relies on multi-factor authentication, with a UPI-PIN for each transaction [20]. Using a trusted UPI app from a reputable institution is vital, as they undergo rigorous security testing and employ data encryption. Double-checking recipient details, being cautious about URLs, and reviewing QR codes are essential precautions. Avoiding public Wi-Fi and computers is also advised for secure digital transactions, ensuring seamless interoperability between UPI service providers.

- a) Implement standardized protocols and APIs per NPCI guidelines for consistent communication between UPI service providers.
- b) Enable cross-platform compatibility by mapping UPI IDs (VPAs) for universal transactions.
- c) Develop routing mechanisms for accurate fund transfers based on the recipient's UPI ID.
- d) Define transaction and security standards for consistent and secure UPI operations.
- e) Ensure interoperability aligns with evolving regulations, focusing on efficient settlement processes.
- f) Institute interoperability testing and certification for new UPI providers.
- g) Prioritize a consistent and user-friendly experience, including dispute resolution procedures.
- h) Educate users on interoperability and encourage feedback for ongoing system enhancement.

#### **5.4 SIMPLIFYING THE COMPLEX REGISTRATION PROCESSES**

Simplifying the UPI (Unified Payments Interface) registration process is crucial for user adoption. This can be achieved by providing clear instructions at each step, using pre-filled forms, enabling mobile wallet integration, offering biometric verification, allowing offline registration, providing in-app support and chatbots, offering multilingual support, creating step-by-step video tutorials, implementing error handling, and encouraging user feedback. These strategies enhance accessibility and user-friendliness, ultimately boosting UPI adoption and satisfaction.

#### **5.5 LIMITED MERCHANT ACCEPTANCE AND TRANSACTION LIMITS SOLUTIONS**

Addressing limited merchant acceptance and transaction limits is critical to boosting UPI adoption and usability. This can be achieved by educating and incentivizing merchants, conducting training programs, promoting UPI QR codes, offering multiple KYC levels, reviewing user accounts periodically, creating corporate UPI accounts, and ensuring compliance with regulatory guidelines. These best practices expand merchant acceptance and provide users with suitable transaction limits, enhancing UPI's convenience and adaptability for various financial needs.

### **VI. CONCLUSIONS**

In the contemporary era, Unified Payment Interfaces (UPI) play a crucial role in enhancing digital experiences, but they are not without challenges. Several best practices are essential to optimize this digital payment system. This entails implementing strong security measures such as two-factor authentication and biometric verification, utilizing AI and machine learning for fraud prevention, protecting user privacy with encryption and explicit consent, offering adequate customer support for transaction disputes, advocating for standardization to enhance compatibility, tackling scalability and redundancy challenges, promoting financial inclusion through education, ensuring regulatory compliance, and raising user awareness of phishing threats. Failed transactions are another common challenge with UPI transactions constantly. The complex web of limitations is another challenge with UPI transactions. While the National Payments Corporation of India (NPCI) set a limit of 20 transactions and ₹1 lakh per day, individual banks and apps have implemented their restrictions, creating a complex web of limitations. Social engine's most significant acts are India's most considerable security risk during confinement (lockdown). UPI currently constitutes well over 40% of all digital transactions in India. It has boosted small businesses and street vendors, enabling fast and secure bank-to-bank transactions, even for considerably small amounts. It also facilitates quick money transfers for migrant workers. The technology is convenient as it requires minimum physical intervention, making it possible to transfer money simply by scanning a QR code. Continuous feedback and adaptation are necessary to ensure UPI payments remain secure and reliable in the ever-evolving digital landscape. Users can significantly minimize the risks associated with UPI transactions by being aware of these challenges and taking the necessary precautions.

## VII. REFERENCES

- [1] S. Kumar and S. Dixit, "Unified Payments Interface (UPI): A Game Changer in Digital Payment System," *Procedia Computer Science*, vol. 132, pp. 406-411, 2018.
- [2] Singh and D. Tripathi, "A Study on User Experience in Unified Payment Interface (UPI) for Digital Transactions in India," *Journal of Internet Banking and Commerce*, vol. 25, no. 2, pp. 1-14, 2020.
- [3] P. Pandey and S. Gupta, "Security and Privacy Challenges in Unified Payment Interface (UPI): A Review," *Procedia Computer Science*, vol. 167, pp. 236-244, 2019.
- [4] Premchand and A. Choudhry, "Future of Payments-ePayments," *International Journal of Emerging Technology and Advanced Engineering*, vol. 5, pp. 110-115, 2015.
- [5] S. Raghavan and A. Singh, "Unified Payments Interface (UPI) in India: Challenges and Opportunities for Financial Inclusion," *Journal of Financial Services Marketing*, vol. 23, no. 3, pp. 123-134, 2018.
- [6] P. Ahuja and S. Nanda, "A Comprehensive Review of Unified Payment Interface (UPI) in India: Challenges and Opportunities," *Journal of Digital Banking*, vol. 6, no. 2, pp. 122-134, 2021.
- [7] B. Philip, "Unified Payment Interface -Impact of UPI on Customer Satisfaction," *Research Guru: Online Journal of Multidisciplinary Subjects*, vol. 4, no. 12, pp. 124-129, 2019.
- [8] Dhore, V. Joshi, and S. Baral, "Digital Payments Transformation in India: Trends, Issues, and Opportunities," in *Fostering Sustainable Businesses in Emerging Economies*, chap. 14, pp. 249-259, 2023.
- [9] W. Ahmed et al., "Security in Next Generation Mobile Payment Systems: A Comprehensive Survey," *IEEE Access*, vol. 9, pp. 115932-115950, 2021, doi: 10.1109/ACCESS.2021.3105450.
- [10] X. Deng and T. Gao, "Electronic payment schemes based on Blockchain in vents," *IEEE Access*, vol. 8, pp. 38296-38303, 2020.
- [11] M. Sirajul Islam Khando and S. Gao, "The Emerging Technologies of Digital Payments and Associated Challenges: A Systematic Literature Review," *Future Internet*, vol. 15, no. 1, p. 21, 2023, doi: 10.3390/fi15010021.
- [12] N. Dubey, "Digital payments: How to resolve failed UPI payments, mitigate risks, and ensure smooth transactions," *Business Today*, Aug. 30, 2023.
- [13] R. Vij, "Unified Payment Interface (UPI)-Stimulates Financial Inclusion," *EPRA International Journal of Multidisciplinary Research (IJMR)*, vol. 9, no. 3, pp. 107-112, Mar. 2023.
- [14] R. Kumar, S. Kishore, H. Lu, and A. Prakash, "Security Analysis of Unified Payments Interface and Payment Apps in India," in *USENIX Security Symposium*, 2020.
- [15] S. Boke and O. Harkare, "Review on Unified Payment Interface Advancement Towards Digitalization and Challenges Faced," *Episteme*, vol. 3, no. 7, pp. 57-62, 2018.
- [16] Y. Madwanna, M. Khadse and B. R. Chandavarkar, "Security Issues of Unified Payments Interface and Challenges: Case Study," 2021 2nd International Conference on Secure Cyber Computing and Communications (ICSCCC), Jalandhar, India, 2021, pp. 150-154, doi: 10.1109/ICSCCC51823.2021.9478078.
- [17] S. K. Sahu and A. Sharma, "Impact of Unified Payment Interfaces (UPIs) on Digital Payment Systems in India," *International Journal of Computer Science and Engineering*, vol. 10, no. 3, pp. 1-5, 2022.
- [18] P. Kaur and J. Singh, "Unified Payment Interfaces (UPIs): A Review of Challenges and Opportunities," *International Journal of Information Technology and Management*, vol. 20, no. 6, pp. 1293-1301, 2021.
- [19] S. K. Gupta and A. Kumar, "Unified Payment Interfaces (UPIs) in India: A Review of Opportunities and Challenges," *International Journal of Engineering and Advanced Technology*, vol. 9, no. 3, pp. 1429-1432, 2020.
- [20] S. Boke and O. Harkare, "Interoperability Issues of Unified Payment Interfaces (UPIs): A Review," *International Journal of Computer Science and Engineering (IJCSE)*, vol. 11, no. 4, 2023.

- [21] "An introduction to NPCI and its various products," National Payments Corporation of India.
- [22] J. Narayanan, "A Study on Growth of UPI Apps in India after Covid Outbreak," International Journal of Emerging Technologies and Innovative Research, vol. 8, no. 9, pp. ppc333-c338, Sep. 2021, Available at: <http://www.jetir.org/papers/JETIR2109243.pdf>.
- [23] D. M. Kolte and V. R. Humbe, "Study of UPI/BHIM Payment System in India," International Journal of Science and Research (IJSR), vol. 9, no. 12, pp. 228-232, 2020.

