Working Paper

IIMK/WPS/638/FIN/2025/05

March 2025

Adoption of UPI as a mode of payment in India
Challenges and way ahead

Vishal Vaibhav [1]
Pankaj Kumar Baag [2]

[1]PGP LSM Student, Indian Institute of Management Kozhikode, IIMK Campus PO, Kunnamangalam, Kozhikode, Kerala 673 570, India.

[2]Associate professor, Finance, Accounting and Control Area, Indian Institute of Management Kozhikode, IIMK Campus PO, Kunnamangalam, Kozhikode, Kerala 673 570, India; Email - baagpankaj@iimk.ac.in, Phone Number - 0495 2809121

Abstract

The adoption of Unified Payments Interface (UPI) in India has revolutionized the digital payment landscape, making cashless transactions seamless, efficient, and widely accessible. This study explores the key drivers and barriers influencing UPI adoption among different demographic groups, using primary survey data collected from **405 respondents** across various age groups, locations, and occupations.

The research identifies **convenience, faster transactions, and security & fraud protection** as the most critical factors influencing user adoption, while government initiatives and cashback offers play a relatively secondary role. **Google Pay and PhonePe emerge as dominant players**, capturing a significant share of users due to their intuitive interfaces and transaction reliability. However, **Paytm's lower adoption rate and BHIM UPI's struggle for relevance** highlight the challenges faced by alternative platforms.

Additionally, **urban users** lead in adoption, but **semi-urban and rural markets are emerging as crucial growth areas**, emphasizing the need for targeted financial inclusion strategies. The study also examines non-adopters, revealing concerns over security, digital literacy, and trust in online transactions as key deterrents. Findings from this research provide actionable insights for fintech companies, policymakers, and financial institutions to **enhance UPI penetration, improve user experience, and address security concerns**.

Keywords: UPI, Digital Payments, Fintech, Adoption, India, Financial Inclusion, Security, Google Pay, PhonePe, BHIM UPI, Cashless Economy

Executive Summary

This study examines the **adoption of Unified Payments Interface (UPI) in India**, analysing how user behaviour, demographic trends, and key influencing factors shape its widespread usage. While UPI has transformed digital transactions, its growth is not solely driven by technological convenience but also by trust, incentives, and accessibility.

By analysing survey data from **405 respondents**, this research identifies **ease of use, transaction speed, and security** as the most critical factors driving adoption. **Google Pay and PhonePe emerge as market leaders**, while **Paytm's declining market share** highlights shifting user preferences. Government-backed solutions like **BHIM UPI struggle to gain traction**, reinforcing the role of private fintech players in driving digital payments.

Findings confirm that **urban users lead UPI adoption**, but **semi-urban and rural penetration is rising**, signalling a shift toward financial inclusion. Additionally, while **young consumers (18-24) are the most active users**, homemakers and self-employed individuals also represent key growth segments. However, **security concerns, digital literacy gaps, and trust issues remain barriers for older and non-adopting users**.

This study also explores strategic challenges such as **balancing fintech profitability with consumer incentives, regulatory compliance, and fraud prevention**. While focused on UPI in India, the insights extend to broader discussions on **digital financial ecosystems, mobile payment adoption, and emerging fintech innovations worldwide**.

For **fintech firms, policymakers, and investors**, this research reinforces that UPI is more than just a payment method—it is a **catalyst for financial inclusion, economic efficiency, and digital transformation**.

Table of Content

5. Results and Findings

5.1. Primary Data Analysis

5.1.1. Quantitative Findings (Survey Data in Percentages)

5.1.2. UPI Adoption Rates Among Rural Women

5.1.3. Challenges in UPI Usage

5.2. Qualitative Findings (Interviews & Transcriptions)

5.2.1. Trust Issues with UPI

5.2.2. Dependency on Male Family Members

5.2.3. Banking Awareness Gaps

5.3. Secondary Data Analysis

5.3.1. UPI Adoption & Financial Inclusion Trends

5.4. Financial Inclusion & UPI Usage Among Women

5.5. Challenges in Financial Literacy

5.6. Dark Patterns & Hidden Charges in UPI Platforms

5.7. Technical & User Experience Issues in UPI Platforms

5.8. Refund Processing & Complaint Redressal

5.9. Societal & Economic Barriers to UPI Adoption

5.10. Government Policies & Their Impact

6. Conclusion of the Study on UPI Adoption in India

6.1. Managerial Implications

6.1.1. Targeted Financial Literacy Programs

6.1.2. Simplified UPI Onboarding & Transaction Processes

6.1.3. Stronger Fraud Protection Measures

6.1.4. Gender-Specific Digital Strategies

6.1.5. Regulation & Monitoring of Dark Patterns

1. Introduction

1.1. The Genesis of UPI

The journey of digital payments in India began long before the introduction of UPI, tracing its roots back to the late 1990s and early 2000s when Internet banking first started to gain traction. However, traditional banking systems, including digital alternatives, often proved cumbersome, fragmented, and inaccessible to many. India's large, geographically dispersed population, combined with its predominantly cash-based economy, made it difficult for banks and financial institutions to cater to every individual.

1.2. Early Digital Payment Methods

Before UPI, India had various digital payment mechanisms, such as the National Electronic Funds Transfer (NEFT) system, Real-Time Gross Settlement (RTGS), and Immediate Payment Service (IMPS). NEFT and RTGS were primarily used for high-value transactions, and while effective, they involved multiple steps and significant time delays, which deterred small businesses and individuals from using them regularly. Additionally, RTGS could only be used during business hours, further limiting its utility for everyday users. IMPS, launched by NPCI in 2010, brought some improvement by enabling instant interbank money transfers 24/7, but it did not scale to the extent needed to meet the demands of an increasingly mobile-first population.

Digital wallets like Paytm, FreeCharge, and Mobikwik also emerged around this time, allowing users to store money in a digital wallet linked to their mobile phones. Although these platforms saw early success, especially among younger users, their interoperability was limited. Funds could not be transferred seamlessly between wallets or between wallets and bank accounts, which created friction in the ecosystem.

1.3. Challenges in Traditional Banking

India's banking infrastructure, particularly in rural and semi-urban areas, faced significant hurdles. Traditional bank branches were often understaffed and poorly distributed, leaving large sections of the population without easy access to banking services. According to data from the Reserve Bank of India (RBI), over 19% of Indian households lacked access to formal banking services as late as 2011. This figure was even higher in rural areas, where nearly 40% of households were excluded from the formal financial system.

The Indian economy's reliance on cash presented another challenge. Cash transactions accounted for nearly 80% of all transactions before the launch of UPI, leading to inefficiencies and high transaction costs. Managing cash payments is resource-intensive, requiring storage, transportation, and security, all of which increase overhead costs for businesses. For consumers, the inability to make fast, efficient digital payments limited their participation in the digital economy.

1.4. The Rise of the Mobile Economy

By the mid-2010s, India had witnessed an explosive growth in mobile phone penetration. According to data from the Telecom Regulatory Authority of India (TRAI), mobile phone subscriptions exceeded 1 billion by 2015, with a significant portion being smartphones. As internet penetration grew alongside affordable data plans, largely driven by telecom giants like Jio, there was a clear opportunity for the financial system to capitalize on this burgeoning mobile economy.

The RBI and the Indian government recognized the need to modernize India's payments infrastructure to serve this mobile-first population better. In response, the National Payments Corporation of India (NPCI) was established in 2008, with the goal of developing a national infrastructure for retail payment systems. NPCI's mandate was to create a unified system that

could handle a wide range of payment use cases—consumer-to-consumer (C2C), consumer-to-business (C2B), and business-to-business (B2B)—in a more streamlined and efficient manner than existing systems.

1.5. Launch of UPI

The creation of UPI stemmed from the desire to overcome the fragmentation and inefficiencies that characterized India's payments landscape. UPI was designed as a real-time payments system that would allow users to transfer funds instantly between bank accounts, using just a mobile device. Unlike digital wallets, UPI didn't require users to pre-load money into a separate account; instead, it facilitated direct transfers from one bank account to another. This was a revolutionary approach at a time when most other digital payment platforms required some intermediary storage of funds.

Launched in 2016, UPI was initially viewed as a supplementary service to traditional digital payment methods. However, it quickly gained traction due to its simplicity and the government's push for a digital economy. The timing of UPI's launch coincided with Prime Minister Narendra Modi's announcement of demonetization in November 2016, when the government invalidated ₹500 and ₹1,000 currency notes, effectively removing over 85% of cash from circulation. Demonetization forced millions of Indians to seek alternatives to cash, and UPI emerged as a convenient and immediate solution.

UPI's architecture allowed for seamless integration with multiple banks, providing users with the flexibility to link any number of bank accounts to a single virtual payment address (VPA). The interoperability between banks was a crucial factor in UPI's success, as it eliminated the need for multiple apps or wallets. For example, a user could transfer money from an account in State Bank of India (SBI) to an account in HDFC Bank without any third-party intermediary.

1.6. UPI as a Government Initiative

The Indian government played an instrumental role in popularizing UPI by integrating it with public services and welfare schemes. Direct Benefit Transfers (DBT), where subsidies and benefits were directly credited to the bank accounts of beneficiaries, became more efficient with UPI. Welfare programs like the Pradhan Mantri Jan Dhan Yojana (PMJDY), which aimed to provide bank accounts to all unbanked individuals, also found a ready complement in UPI's digital payments framework. The combination of these efforts provided a powerful incentive for people to adopt UPI, as it became a conduit for receiving government benefits as well as for making everyday payments.

NPCI and RBI also ensured that UPI remained affordable for both users and merchants by implementing a zero-fee structure for person-to-person (P2P) transactions and a very low fee for merchant payments. This incentivized both consumers and merchants to adopt the system without concerns about the costs associated with digital transactions. Furthermore, NPCI's partnerships with tech giants like Google (for Google Pay) and Walmart (for PhonePe) helped UPI reach millions of additional users through private-sector innovation and outreach.

1.7. UPI Ecosystem and Functionality

UPI has grown into a vast ecosystem involving multiple stakeholders, including banks, merchants, Payment Service Providers (PSPs), consumers, and regulatory bodies like the Reserve Bank of India (RBI) and NPCI. This ecosystem is powered by an intricate web of technological innovations, security protocols, and user experience enhancements that make UPI not only the preferred digital payment system in India but also one of the most advanced payment systems globally.

1.8. Core Components of UPI

At the heart of UPI is its real-time, interoperable payments architecture. UPI is built on the Immediate Payment Service (IMPS) infrastructure, which facilitates real-time transfers

between banks. This enables UPI transactions to be settled instantly, 24/7, including on weekends and public holidays, unlike traditional systems like NEFT or RTGS, which have limitations on working hours.

The core components of UPI include:

- **Virtual Payment Address (VPA)**: Every user is required to create a VPA, which serves as an alias for their bank account number. This eliminates the need for users to share sensitive banking details like account numbers and IFSC codes when making payments. The VPA is unique to each user and can be customized, similar to an email address. For example, a VPA might look like user@bank.
- **Banks and Payment Service Providers (PSPs)**: Banks play a critical role in the UPI ecosystem by acting as PSPs. They facilitate UPI transactions for their customers, ensuring that funds are debited and credited correctly. Each bank or PSP offers its own UPI-enabled app, such as BHIM, PhonePe, Google Pay, and Paytm, which provides users access to UPI services.
- **Payment Authentication**: UPI's strong focus on security is evident through its use of two-factor authentication (2FA). Users must verify their transactions using a UPI PIN, which is a secure password known only to the user. In some cases, biometric authentication (fingerprint or facial recognition) can also be used for additional security.
- **NPCI's Role as a Central Clearing Authority**: NPCI serves as the backbone of the UPI system. It handles the clearing and settlement of UPI transactions, ensuring that funds are transferred from the payer's bank account to the payee's bank account in real time. NPCI's robust technological infrastructure allows it to manage billions of transactions each month without compromising speed or security.

1.9. User Experience and Interface

UPI's user-centric design is one of its most significant achievements. The system is intuitive and easy to use, even for individuals with limited digital literacy. The UPI apps offered by various PSPs come with simple, guided interfaces that require minimal input from the user. Users only need to link their bank account to the UPI app and set a UPI PIN to get started. Payments can be made by simply entering the recipient's VPA or scanning a QR code. This ease of use has been instrumental in UPI's widespread adoption across demographics, from tech-savvy millennials to rural homemakers.

- **P2P and P2M Transactions**: UPI supports both peer-to-peer (P2P) and peer-to-merchant (P2M) transactions, making it versatile for various payment needs. P2P transactions allow users to send money instantly to friends and family by entering their VPA or mobile number. P2M transactions, on the other hand, involve paying merchants for goods and services, typically by scanning a QR code displayed at the point of sale.
- **Request Money Feature**: UPI also allows users to "request" money from others, making it ideal for situations where one party needs to collect funds from multiple individuals, such as splitting bills among friends. Once a request is sent, the recipient can approve it, and the amount is automatically debited from their account.
- **QR Code Payments**: The QR code functionality has significantly boosted merchant adoption of UPI, particularly among small businesses. Merchants display a unique QR code that customers can scan using any UPI app to complete the payment. This eliminates the need for expensive point-of-sale (POS) terminals, making it an attractive option for micro-entrepreneurs, street vendors, and small retailers.
- **UPI 2.0 Features**: Launched in 2018, UPI 2.0 brought several new features to enhance user experience and expand the functionality of the system. These included overdraft

accounts, enabling users to link their UPI ID with overdraft facilities provided by their bank, and mandates, which allowed users to pre-authorize recurring payments such as utility bills and subscriptions.

1.10. Security and Two-Factor Authentication

Security is a paramount concern in digital payments, and UPI addresses this with multiple layers of protection. The use of two-factor authentication (2FA) ensures that every transaction is authorized only after the user verifies their identity. The two factors typically include the user's mobile device (something they own) and the UPI PIN (something they know). In some cases, PSPs offer biometric authentication as an additional layer of security. For instance, users of smartphones with fingerprint sensors or facial recognition can authenticate transactions using these biometrics, enhancing both security and convenience.

- **Dynamic Linking and Fraud Detection**: One of UPI's innovative security features is dynamic linking, where the payer's bank and the payee's bank communicate directly, ensuring the transaction is valid and secure. NPCI also uses AI-based fraud detection algorithms to monitor transaction patterns and flag suspicious activities. According to NPCI's internal reports, UPI's fraud detection system prevented millions of potentially fraudulent transactions in 2023.
- **Tokenization and Encryption**: UPI transactions are encrypted end-to-end, ensuring that sensitive data, such as bank account details and UPI PINs, are never exposed during the transaction process. NPCI is also in the process of implementing tokenization, which replaces sensitive payment information with a token that can be used for future transactions. This reduces the risk of data breaches and enhances the overall security of the UPI ecosystem.

1.11. Role of NPCI in the UPI Ecosystem

The National Payments Corporation of India (NPCI) is the governing body responsible for developing and maintaining UPI. NPCI ensures the smooth operation of UPI by managing the clearing and settlement processes between banks and PSPs. It also handles dispute resolution, fraud prevention, and ensures compliance with regulatory guidelines issued by the Reserve Bank of India (RBI). NPCI's strong governance structure has been pivotal in making UPI one of the most trusted and widely used digital payment systems in the world.

In addition to its domestic responsibilities, NPCI has been actively promoting UPI as a global payments system. In recent years, NPCI International Payments Limited (NIPL) has forged partnerships with several countries, including Bhutan, Singapore, and the UAE, to expand UPI's reach beyond India's borders. NPCI's vision is to position UPI as a globally recognized payment standard, much like Visa or Mastercard.

1.12. Growth and Expansion of UPI

UPI has experienced exponential growth since its launch in 2016. Its evolution from a supplementary digital payments service to the backbone of India's digital economy is marked by key milestones, strategic initiatives, and a confluence of market forces that made its adoption inevitable. This section delves into the trajectory of UPI's expansion and the pivotal factors that fuelled its rapid scaling.

1.13. Initial Reception and Growth Trajectory

UPI's initial reception was measured, as the system was relatively unknown to the general public and still developing its feature set. When UPI was first introduced, it supported a limited number of banks and had relatively low user adoption compared to established digital wallets like Paytm and Mobikwik. In the first few months after its launch, UPI processed just a few hundred thousand transactions a day, primarily through apps like BHIM (Bharat Interface for Money), which was NPCI's own UPI application aimed at driving initial user adoption.

However, the turning point for UPI came in November 2016, when the Indian government announced the demonetization of ₹500 and ₹1,000 currency notes. The sudden removal of 86% of the cash in circulation created an immediate demand for alternative payment methods. UPI, with its interoperable, real-time payments system, emerged as a viable solution to replace cash for a wide range of transactions. Demonetization forced consumers and businesses to look for cashless options, and UPI capitalized on this need.

By 2017, UPI had crossed 10 million transactions per month, with over 20 banks joining the platform. This was just the beginning. The following years saw a hockey-stick growth curve, with both transaction volumes and values skyrocketing as more banks, Payment Service Providers (PSPs), and merchants adopted UPI. By the end of 2018, UPI had processed over 600 million transactions a month, indicating widespread user acceptance.

1.14. Key Milestones in UPI's Journey

Several milestones in UPI's development have been crucial to its growth and expansion:

- **UPI 2.0**: Launched in August 2018, UPI 2.0 introduced several new features that made the platform more versatile and user-friendly. These included the ability to link overdraft accounts to UPI, allowing users to make payments even when their account balances were low. UPI 2.0 also introduced mandates, enabling recurring payments such as utility bills and subscriptions to be pre-authorized. Another key feature was invoice in the inbox, which allowed users to verify the invoice before making a payment, thereby enhancing trust in P2M transactions.
- **QR Code Standardization**: The introduction of QR code payments was another milestone that contributed to UPI's massive growth, particularly among small merchants. QR codes enabled seamless payments without the need for expensive Point of Sale (POS) machines. Merchants across the country, from large retail chains to small

street vendors, could now accept digital payments using a simple QR code displayed at their stores.

- **UPI on Feature Phones (UPI123Pay)**: UPI's reach was further expanded with the launch of UPI123Pay in 2022, which enabled users of feature phones to perform digital transactions without requiring an internet connection. This was a crucial development, particularly for rural and semi-urban India, where internet penetration is still low. UPI123Pay allows users to initiate payments through Interactive Voice Response (IVR) systems, missed calls, and voice commands, ensuring that UPI's reach extends beyond smartphone users.

1.15. UPI's Transaction Growth: Volume and Value

One of the most remarkable aspects of UPI's growth is the sheer volume and value of transactions processed on the platform. In its first year, UPI processed just over 92 million transactions. Fast forward to 2023, and that figure has ballooned to over 12 billion transactions per month. This exponential growth is a testament to UPI's ability to scale and meet the demands of a diverse user base, including individuals, small businesses, and large corporations.

As of 2023, UPI accounts for more than 65% of all digital retail payments in India. The system handles over ₹22 trillion in monthly transaction value, making it the most significant digital payment system in the country. The COVID-19 pandemic further accelerated the adoption of UPI as people sought contactless payment options to avoid handling cash. By the end of 2021, UPI had crossed 4 billion monthly transactions, driven largely by an increase in both P2P and P2M transactions.

UPI's scalability is one of its key strengths. NPCI's infrastructure is designed to handle billions of transactions daily without significant delays or downtimes. In 2023, UPI's transaction success rate was over 99%, a figure that surpasses many global payment systems.

1.16. The Role of Strategic Partnerships

UPI's growth has also been fuelled by strategic partnerships with both domestic and international players. The involvement of technology giants like Google, Walmart (PhonePe), and Amazon has significantly boosted UPI's user base. Google Pay and PhonePe, in particular, have become dominant players in the UPI ecosystem, with each controlling a significant market share. These companies invested heavily in user acquisition, offering cashbacks, rewards, and incentives for using UPI to make payments.

Internationally, NPCI has worked to expand UPI's footprint beyond India's borders. In 2021, UPI was launched in Bhutan, marking its first international rollout. NPCI has since partnered with payment networks in countries like Singapore, the UAE, and Nepal to enable cross-border UPI transactions. The goal is to make UPI a global payment system, similar to Visa and Mastercard.

1.17. Driving Merchant Adoption

While UPI initially gained popularity through P2P transactions, its growth in the merchant payments space has been equally significant. NPCI has worked closely with the Indian government and private sector to drive merchant adoption of UPI. The introduction of zero MDR (Merchant Discount Rate) for transactions up to ₹2,000 played a pivotal role in encouraging small merchants to adopt UPI as a payment method. This zero-cost structure made UPI highly attractive for small and medium-sized enterprises (SMEs) who were previously deterred by the high costs of accepting digital payments.

UPI's flexibility in integrating with various PSP apps has also helped bring more merchants on board. Merchants can accept payments from any UPI-enabled app, providing a level of convenience that was previously unavailable with other payment systems. The ability to accept payments via QR codes has enabled even the smallest vendors, like roadside tea stalls and

vegetable sellers, to adopt digital payments, further driving UPI's expansion into the unorganized retail sector.

1.18. Global Expansion and Ambitions

UPI's ambitions go far beyond India. NPCI, through its international arm, NPCI International Payments Limited (NIPL), has been actively working to replicate the success of UPI in other countries. One of the key milestones in UPI's global expansion was its integration with Singapore's PayNow, allowing real-time, cross-border fund transfers between the two countries. This integration not only strengthens UPI's global presence but also opens up opportunities for remittances, a significant financial activity for India.

NPCI has also partnered with payment systems in the UAE, Bhutan, and Nepal, enabling UPI's usage in these countries. The long-term goal is to establish UPI as a global payment system on par with Visa and Mastercard, facilitating international transactions and enabling Indian tourists and businesses to use UPI abroad. NPCI's global benchmarking reports indicate that UPI has already started to outperform some of its international counterparts, such as PIX in Brazil and Swish in Sweden, in terms of transaction volume.

1.19. Challenges to Sustaining Growth

Despite its meteoric rise, UPI faces several challenges as it continues to expand. One of the key challenges is the sustainability of the zero-MDR policy, which has been a double-edged sword. While it has driven adoption among merchants, particularly small businesses, it has also made it difficult for banks and PSPs to generate revenue from UPI transactions. This has led to calls from industry stakeholders to reintroduce a nominal MDR to ensure the system's long-term viability.

Another challenge is cybersecurity. As UPI continues to grow, it becomes an attractive target for cybercriminals. Fraudulent transactions, phishing attacks, and identity theft are increasing

concerns. NPCI and banks are continually updating their fraud detection systems to prevent large-scale financial fraud, but the scale of UPI's operations makes this a significant challenge.

1.20. The Role of UPI in Financial Inclusion

One of the most transformative impacts of UPI has been its contribution to financial inclusion in India. By enabling instant digital payments across various socio-economic strata, UPI has brought millions of previously unbanked and underbanked individuals into the formal financial system. Financial inclusion is crucial for economic growth, as it enables individuals to save, invest, and participate in the formal economy. This section explores how UPI has democratized access to financial services and bridged the digital divide.

1.21. Bridging the Digital Divide

Before UPI, accessing formal financial services was a challenge for millions of Indians, particularly those in rural and semi-urban areas. Traditional banking infrastructure was inadequate to meet the needs of India's vast population, especially in remote regions. Many people in these areas lacked access to basic banking services like savings accounts, credit, and remittances, making them reliant on cash transactions and informal financial networks.

The Pradhan Mantri Jan Dhan Yojana (PMJDY), launched in 2014, aimed to address this issue by encouraging every household in India to have at least one bank account. While the PMJDY laid the foundation for financial inclusion by opening millions of bank accounts, UPI built on this foundation by enabling digital transactions that were accessible, free, and instant. UPI played a pivotal role in converting these newly opened bank accounts into active financial participants by offering an easy way to send and receive money digitally.

With its ability to link any bank account to a virtual payment address (VPA), UPI eliminated the need for individuals to carry debit or credit cards, which many did not have. Additionally, UPI's low transaction fees (free for P2P transfers) made it accessible to even the poorest

sections of society, who could now participate in the digital economy without worrying about high costs.

1.22. Expanding Access to Financial Services

UPI has revolutionized the way financial services are delivered, especially in areas where physical banking infrastructure is lacking. By offering real-time money transfers via smartphones, UPI has effectively turned mobile devices into banks. This has been especially impactful in rural areas, where traditional bank branches are sparse, and accessing financial services often involves traveling long distances.

Through partnerships with the Indian government, UPI has also played a key role in delivering social welfare schemes directly to beneficiaries. Direct Benefit Transfers (DBTs) through UPI have significantly reduced leakages in government schemes, ensuring that subsidies and welfare payments reach the intended recipients without the need for middlemen. UPI has been integrated into several government programs, including the Public Distribution System (PDS), the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), and various agricultural subsidy schemes.

The seamless integration of UPI with government schemes has made it easier for millions of individuals, particularly those in rural areas, to receive payments directly into their bank accounts. This has led to a significant increase in the usage of digital financial services among previously excluded populations.

1.23. Reaching Underbanked Populations

One of UPI's most significant achievements has been its ability to reach underbanked populations who were traditionally excluded from the financial system. These populations include daily wage workers, small farmers, and micro-entrepreneurs who typically operate in the informal economy. UPI’s ability to perform real-time, low-cost transactions has been a

game-changer for these groups, allowing them to receive payments, pay bills, and save money electronically.

For instance, many daily wage workers who previously relied on cash payments now receive their wages directly into their UPI-linked bank accounts. This not only provides them with a secure way to store their money but also opens the door to additional financial services, such as savings accounts, loans, and insurance. Micro-entrepreneurs, particularly women in rural areas, have also benefited from UPI, as it enables them to receive payments from customers without needing a physical POS machine.

1.24. The Role of UPI in Promoting Gender Equality

Financial inclusion is closely linked to gender equality, as women are often disproportionately excluded from the formal financial system. In India, UPI has played a critical role in empowering women, particularly those in rural areas, by providing them with access to digital financial services. Many women who were previously dependent on male family members for access to cash now have their own bank accounts and can perform transactions independently using UPI.

The government's push for financial inclusion through UPI has been particularly beneficial for women enrolled in self-help groups (SHGs) and other microfinance initiatives. These women, who often run small businesses or cooperatives, can now receive payments, save money, and even access credit through UPI-enabled apps.

UPI's role in financial inclusion goes beyond simply providing access to banking services. By enabling digital payments, UPI has empowered women to become more financially independent, participate in the formal economy, and take control of their financial futures.

1.25. Inclusion through UPI123Pay: Feature Phones

While smartphones have been a key driver of UPI adoption, NPCI recognized that a significant portion of the population still uses feature phones, particularly in rural and semi-urban areas. In 2022, NPCI launched UPI123Pay, which allows users to make digital transactions through feature phones without requiring an internet connection.

UPI123Pay offers several methods for initiating payments, including:

- **Interactive Voice Response (IVR)**: Users can dial a number and follow voice commands to initiate payments.
- **Missed Call Payments**: Users can give a missed call to a designated number, and the system will call them back to confirm and complete the transaction.
- **App-based Payment for Feature Phones**: Feature phones with certain capabilities can use an app that allows for simplified UPI transactions.

By offering these solutions, NPCI ensured that UPI's benefits could reach even the most remote and underbanked areas, where smartphone penetration is still low. UPI123Pay has opened up new possibilities for financial inclusion, allowing millions of feature phone users to participate in the digital economy.

1.26. UPI for Small and Marginal Farmers

Agriculture forms the backbone of the Indian economy, with nearly 58% of India's population dependent on agriculture for their livelihood. However, small and marginal farmers have traditionally been excluded from formal financial services, relying instead on informal credit systems and cash transactions. UPI has started to change this by enabling farmers to receive payments directly into their bank accounts.

For instance, farmers enrolled in the government's Direct Benefit Transfer (DBT) schemes can receive subsidies for fertilizers, seeds, and other agricultural inputs directly through UPI.

Additionally, UPI's low transaction costs make it easier for farmers to sell their produce in digital marketplaces or directly to consumers without relying on middlemen.

UPI has also played a role in expanding access to credit for farmers. By linking their UPI IDs to formal banking services, farmers can now apply for loans and receive funds instantly. This has helped reduce their dependence on informal moneylenders, who often charge exorbitant interest rates.

1.27. Challenges in Financial Inclusion

While UPI has made significant strides in promoting financial inclusion, several challenges remain. Digital literacy, particularly in rural areas, is still a major barrier to widespread UPI adoption. Many individuals, especially older generations, are unfamiliar with how digital payments work and are hesitant to use UPI for fear of making mistakes or being scammed.

Another challenge is the lack of internet connectivity in certain parts of India. Although UPI123Pay addresses some of these issues by enabling transactions without internet access, the overall digital infrastructure in many rural areas needs improvement to fully realize UPI's potential.

Moreover, cybersecurity remains a concern, particularly for new users who are unfamiliar with digital financial services. Fraudsters often target these users through phishing attacks, fake UPI apps, and other scams. NPCI has taken steps to improve security, but increasing user awareness of digital risks is crucial for ensuring that financial inclusion efforts through UPI are sustainable.

1.28. Government Policies and Regulatory Support

Government policies and regulations have played a pivotal role in shaping the growth and success of the Unified Payments Interface (UPI). From incentivizing digital payments to

implementing key reforms, the Indian government, along with the Reserve Bank of India (RBI) and the National Payments Corporation of India (NPCI), has worked cohesively to create an environment conducive to UPI's widespread adoption. This section will discuss the critical policy interventions and regulatory measures that have facilitated UPI's meteoric rise as India's preferred digital payments system.

1.29. Government's Role in Promoting Digital Payments

The Indian government's vision of a "Digital India" has been one of the driving forces behind the proliferation of UPI and other digital payment systems. The **Digital India** initiative, launched in 2015, aims to empower citizens by providing access to digital infrastructure and services. UPI became a key enabler of this vision, providing a seamless platform for financial transactions that could be accessed via mobile phones, aligning perfectly with the government's goal of transforming India into a cashless economy.

A significant boost to UPI adoption came with the government's demonetization move in November 2016. When ₹500 and ₹1,000 currency notes were suddenly withdrawn from circulation, a massive cash shortage ensued. The government encouraged citizens to switch to digital payments as an alternative to cash, and UPI emerged as one of the most convenient and accessible platforms for this transition. The digital payments ecosystem received a major push, and UPI quickly gained momentum as people sought alternatives to cash for everyday transactions.

1.30. Demonetization: A Catalyst for UPI Growth

Demonetization was a watershed moment in India's financial history, and UPI's trajectory post-demonetization offers a textbook example of how government policies can accelerate technological adoption. Before demonetization, UPI was still in its infancy, processing only a few hundred thousand transactions per month. However, once cash became scarce, UPI

provided a digital solution that allowed individuals and businesses to continue transacting without relying on physical currency.

This period saw a surge in the number of users and transactions on the UPI platform, and its monthly transaction volumes grew by 400% in just a few months. The government further incentivized UPI by waiving merchant transaction fees (Merchant Discount Rate or MDR) for small-value transactions, making it more attractive for merchants to adopt UPI. This policy led to a widespread acceptance of UPI among small and medium-sized enterprises (SMEs) and micro-businesses that had previously been reluctant to accept digital payments due to the associated costs.

1.31. Direct Benefit Transfer (DBT) and UPI Integration

One of the most impactful government policies that contributed to UPI's adoption was the integration of UPI with the Direct Benefit Transfer (DBT) scheme. The **DBT** scheme was introduced to streamline the disbursement of government subsidies and welfare benefits by transferring payments directly to beneficiaries' bank accounts, eliminating intermediaries and reducing leakages. By linking UPI with DBT, the government ensured that beneficiaries could receive funds directly in their accounts, which they could access instantly through their UPI-enabled smartphones.

For instance, subsidies for LPG, pensions under the **Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)** scheme, and wages under **MGNREGA** were disbursed through UPI-linked accounts. The integration of UPI with DBT also meant that millions of individuals who previously had limited access to formal banking services could now participate in the digital economy, contributing to financial inclusion on a massive scale. The **Pradhan Mantri Jan Dhan Yojana (PMJDY)** also complemented this effort by encouraging individuals to open bank accounts, which could then be linked with UPI.

1.32. Zero MDR Policy and Its Impact

The government's decision to impose a **zero MDR policy** on UPI transactions below ₹2,000 was a significant regulatory move aimed at promoting digital payments among merchants, particularly small and medium enterprises. Under this policy, merchants are not charged a Merchant Discount Rate (MDR) for accepting small-value payments through UPI, making it a cost-effective option for businesses. While the zero MDR policy was beneficial in driving merchant adoption of UPI, especially in the unorganized retail sector, it has also faced criticism from banks and Payment Service Providers (PSPs) that bear the operational costs of UPI transactions.

Banks and PSPs argue that without MDR revenue, they lack the financial incentive to further invest in UPI infrastructure or expand their services. This has led to debates about the long-term sustainability of the zero MDR policy. Some stakeholders have suggested reintroducing a nominal MDR or offering alternative revenue streams to banks and PSPs to ensure the continued viability of UPI.

1.33. Regulatory Reforms by the RBI

The **Reserve Bank of India (RBI)** has played a critical role in creating a regulatory framework that fosters innovation while ensuring security and financial stability. The RBI's **Vision 2021 for Payment and Settlement Systems** set ambitious targets for the adoption of digital payments, including increasing the number of digital transactions and promoting the use of mobile banking. UPI has been a centrepiece of this strategy, helping the RBI achieve many of its goals.

The RBI has also issued several regulatory guidelines aimed at improving the safety, efficiency, and reliability of the UPI system. For instance, in 2019, the RBI mandated **tokenization** for card transactions, which replaced sensitive card information with a token to enhance security.

This measure was extended to UPI-based card-on-file transactions, helping reduce fraud risks and ensuring that UPI remains a secure platform for digital payments.

Additionally, the RBI's push towards **interoperability** has been instrumental in making UPI a flexible and user-friendly payment system. By allowing seamless integration with multiple banks and payment platforms, the RBI ensured that UPI could become the unifying framework for India's digital payments ecosystem.

1.34. The Role of NPCI as a Regulatory Body

The **National Payments Corporation of India (NPCI)** has been at the forefront of the regulatory and operational oversight of UPI. NPCI, which operates UPI, is responsible for ensuring compliance with regulatory guidelines, maintaining the technological infrastructure for real-time payments, and promoting security and trust within the ecosystem. NPCI has also introduced several innovations to improve the system's functionality and security, such as **UPI 2.0**, which added features like overdraft accounts, and the development of **UPI Lite**, which enables offline payments for small transactions.

Furthermore, NPCI's collaboration with global regulators has enabled UPI to expand internationally. NPCI's role as a regulatory and standard-setting body ensures that UPI can comply with various international payment standards and integrate with other real-time payments systems worldwide.

1.35. Technological Innovations Driving UPI

The Unified Payments Interface (UPI) is more than just a payment platform—it is a technological marvel that brings together cutting-edge innovations to create a seamless, secure, and efficient payments experience for millions of users. UPI's design and infrastructure have been continuously evolving to meet the growing demands of the digital economy, offering new features and improving existing ones to enhance user experience, security, and scalability. This

section explores the technological innovations that have driven UPI's growth and made it a global leader in digital payments.

1.36. Real-Time Payments Infrastructure

One of the defining features of UPI is its **real-time payments** infrastructure. UPI is built on the Immediate Payment Service (IMPS) architecture, which allows instant money transfers between bank accounts 24/7. This is a significant departure from traditional systems like National Electronic Funds Transfer (NEFT) or Real-Time Gross Settlement (RTGS), which have specific working hours and are typically slower.

UPI's ability to process payments in real time has made it a preferred choice for both consumers and businesses, enabling instant settlement of transactions. This is particularly beneficial for small merchants who rely on immediate cash flow. The **instantaneous nature of UPI transactions** also enhances user trust, as users can see the results of their payments immediately.

1.37. Interoperability and Open APIs

A key factor behind UPI's success is its **interoperable architecture**, which allows seamless transactions between different banks and payment service providers (PSPs). This interoperability is made possible through the use of **open APIs (Application Programming Interfaces)**, which enable different payment platforms and banks to communicate with each other in real time. Open APIs have facilitated the integration of UPI with various third-party applications, such as Google Pay, PhonePe, and Paytm, which offer UPI services to millions of users across the country.

UPI's open architecture ensures that users are not restricted to a single bank or app. A user with an account in Bank A can seamlessly send money to a user with an account in Bank B, using any UPI-enabled app. This flexibility has been a critical factor in UPI's widespread adoption,

as it eliminates the friction that typically accompanies closed-loop payment systems, where users are confined to a specific platform.

The use of open APIs has also encouraged innovation in the UPI ecosystem, allowing fintech companies to build additional services on top of UPI, such as lending, insurance, and investment platforms. These innovations have transformed UPI from a payments system into a more comprehensive financial services platform.

1.38. UPI 2.0 and Beyond: New Features and Enhancements

UPI has undergone several upgrades since its launch, with **UPI 2.0** being one of the most significant. Introduced in August 2018, UPI 2.0 brought several new features aimed at improving the functionality and user experience of the platform. Key features of UPI 2.0 include:

- **Overdraft Accounts**: UPI 2.0 introduced the ability to link overdraft accounts, allowing users to make payments even when their bank account balance is low. This feature effectively turns UPI into a credit-based payments system, offering greater flexibility to users.
- **Mandates for Recurring Payments**: UPI 2.0 introduced the concept of mandates, which allow users to pre-authorize recurring payments for services like utilities, subscriptions, and insurance premiums. This has made UPI a convenient option for businesses that rely on recurring billing.
- **Invoice in the Inbox**: To enhance the security and transparency of P2M transactions, UPI 2.0 added the "invoice in the inbox" feature, which allows users to review and verify invoices before making a payment. This feature has been particularly useful for merchants, as it builds trust and reduces the chances of disputes.

UPI Lite is another technological innovation aimed at expanding the use cases for UPI, particularly in areas with poor internet connectivity. UPI Lite allows users to make offline payments for small transactions, enhancing the platform's utility in rural areas where internet access is often limited.

1.39. Artificial Intelligence (AI) and Machine Learning (ML) in Fraud Detection

As UPI's popularity grew, so did the threat of fraudulent activities. To combat this, NPCI has incorporated **Artificial Intelligence (AI)** and **Machine Learning (ML)** technologies into its fraud detection and prevention systems. These technologies are used to monitor transactions in real time, flagging any unusual or suspicious activity that may indicate fraud.

AI-based systems analyze transaction patterns and user behavior to detect anomalies that could signify phishing attacks, account takeovers, or unauthorized transactions. For instance, if a user typically makes small payments within a specific geographic area and suddenly initiates a large transaction from a different location, the system will flag this as a potentially suspicious activity and may temporarily block the transaction or prompt additional verification steps.

Incorporating AI and ML has significantly reduced the incidence of fraud on the UPI platform, ensuring that users can transact with confidence. NPCI continues to invest in these technologies to stay ahead of evolving threats in the digital payments space.

1.40. Tokenization and Encryption

To enhance the security of UPI transactions, **tokenization** and **end-to-end encryption** have been implemented across the platform. Tokenization replaces sensitive payment information, such as bank account numbers and UPI IDs, with a unique token that can only be used for that specific transaction. This ensures that even if a malicious actor intercepts the transaction data, they cannot use the tokenized information to perform fraudulent activities.

End-to-end encryption ensures that all UPI transactions are securely transmitted between the payer's bank and the payee's bank, preventing any third-party interception. The combination of tokenization and encryption has made UPI one of the most secure digital payment platforms globally, instilling confidence in users and contributing to its rapid adoption.

1.41. UPI Plug-ins and the Future of In-App Payments

One of the most recent innovations in the UPI ecosystem is the introduction of **UPI Plug-ins**, which allow third-party apps to integrate UPI payments directly within their platforms. This development has revolutionized the in-app payment experience, making it easier for users to complete transactions without leaving the app. For example, e-commerce platforms like Amazon and Flipkart now allow users to make payments using UPI without having to switch between apps.

UPI Plug-ins offer businesses a streamlined payment solution that enhances the user experience and reduces transaction friction. This is particularly important in the fast-growing e-commerce sector, where seamless payment integration is crucial for improving conversion rates and customer satisfaction.

The future of UPI Plug-ins extends beyond e-commerce, with potential applications in industries such as healthcare, education, and transportation. As more businesses adopt UPI Plug-ins, the platform is expected to become an integral part of various digital services, further cementing its position as India's go-to payment solution.

1.42. The Role of Blockchain and Biometric Authentication in UPI's Future

As UPI continues to evolve, future upgrades may include the integration of **blockchain technology** and **biometric authentication** to enhance security and transparency. Blockchain, with its decentralized and tamper-proof ledger, could be used to record and verify UPI transactions, making the system even more resilient to fraud and cyberattacks.

Biometric authentication, such as fingerprint or facial recognition, is already being used on some UPI-enabled apps, but its adoption could become more widespread in the future. Biometric verification offers a higher level of security than traditional passwords or PINs and is particularly useful for low-tech users who may struggle with remembering complex credentials.

1.43. UPI's Impact on Small and Medium Enterprises (SMEs)

Small and Medium Enterprises (SMEs) are the backbone of India's economy, contributing significantly to GDP, employment, and exports. However, SMEs have historically faced several challenges in accessing financial services, particularly digital payment solutions. UPI has emerged as a game-changer for SMEs, offering an affordable, efficient, and secure way to transact digitally. The introduction of UPI has had far-reaching impacts on the operational efficiency, profitability, and overall financial inclusion of SMEs across India.

1.44. Challenges Faced by SMEs Before UPI

Before UPI, SMEs struggled to adopt digital payment methods due to several factors:

- **High Transaction Costs**: Traditional payment systems like credit and debit card transactions involved high Merchant Discount Rates (MDR), which deterred small businesses from accepting digital payments. The cost of setting up Point of Sale (POS) terminals and maintaining them also added to the burden.
- **Limited Access to Formal Financial Services**: Many SMEs, especially in rural and semi-urban areas, operated largely in cash and had limited access to banking services. The lack of formal banking infrastructure made it difficult for them to adopt digital payment solutions.

- **Slow Transaction Times**: Existing systems like NEFT and RTGS had slower transaction times, which hindered the day-to-day operations of SMEs that relied on quick turnovers to maintain liquidity. Furthermore, these systems were not available 24/7, adding to the inefficiencies.

In this context, UPI offered a transformative solution by enabling real-time, low-cost, and secure digital transactions. By providing an interoperable platform that connected SMEs to a vast network of banks and financial services, UPI bridged the gap between SMEs and the digital economy.

1.45. Empowering SMEs with Low-Cost Digital Transactions

One of UPI's most significant contributions to SMEs has been the reduction of transaction costs. Unlike traditional card payments that involve MDR fees, UPI transactions are either free or come with minimal charges, particularly for low-value transactions. The government's decision to impose a **zero MDR policy** for UPI transactions below ₹2,000 further incentivized SMEs to adopt UPI. This policy ensured that even the smallest of businesses, such as local grocery stores, tea vendors, and micro-entrepreneurs, could accept digital payments without worrying about transaction fees eating into their profits.

Additionally, UPI's QR code-based payment system eliminated the need for expensive POS machines, making it easier and more affordable for SMEs to accept digital payments. SMEs could simply generate a QR code linked to their UPI account, display it at their point of sale, and accept payments from any UPI-enabled app. This flexibility and simplicity helped UPI gain widespread adoption among small businesses that previously relied solely on cash.

1.46. Enhancing Cash Flow and Operational Efficiency

For SMEs, maintaining healthy cash flow is crucial for business survival and growth. UPI's real-time payments system has dramatically improved cash flow management for SMEs by

enabling instant settlement of transactions. Unlike card payments, which could take a few days to settle, UPI payments are credited to the recipient's bank account instantly, ensuring that businesses have access to their funds immediately.

This has been particularly beneficial for businesses with high transaction volumes and small margins, such as retail stores, food vendors, and service providers. The ability to receive payments instantly helps SMEs manage their working capital more efficiently, allowing them to reinvest in their businesses, purchase inventory, and pay suppliers on time.

Additionally, UPI's ease of use has allowed SMEs to streamline their payment processes, reducing the time and effort involved in reconciling accounts. Since UPI provides real-time payment confirmation, businesses no longer need to track down unpaid invoices or wait for payments to clear, improving operational efficiency and reducing administrative costs.

1.47. Expanding Market Reach and Customer Base

One of the most transformative impacts of UPI on SMEs has been its role in expanding market reach. By accepting UPI payments, SMEs can cater to a larger customer base, including tech-savvy millennials, young professionals, and urban consumers who prefer digital payments over cash. The convenience of UPI, combined with its widespread adoption across India, has enabled SMEs to attract and retain a broader set of customers, particularly in urban areas where digital payments are becoming the norm.

Moreover, UPI has facilitated the growth of e-commerce and online businesses, allowing SMEs to sell their products and services online without needing to invest in complex payment gateways. UPI's seamless integration with e-commerce platforms has opened up new revenue streams for SMEs, enabling them to tap into the growing online consumer market.

In addition to expanding their customer base domestically, UPI's international expansion has allowed SMEs to accept payments from foreign customers, particularly in countries like

Bhutan, Singapore, and the UAE, where UPI has been integrated with local payment systems. This has given Indian SMEs access to global markets, enabling them to grow their businesses beyond geographical boundaries.

1.48. Financial Inclusion for Micro-Entrepreneurs

UPI has played a crucial role in promoting financial inclusion among micro-entrepreneurs, who often operate in the informal economy and have limited access to formal banking services. Many micro-entrepreneurs, such as street vendors, artisans, and small-scale service providers, traditionally relied on cash transactions due to the absence of affordable digital payment solutions. UPI has provided these entrepreneurs with an accessible, low-cost digital payment platform, allowing them to participate in the formal economy and access financial services such as savings, credit, and insurance.

By linking their UPI accounts with their bank accounts, micro-entrepreneurs can now receive payments directly into their bank accounts, eliminating the need to carry large amounts of cash. This not only enhances security but also enables them to build a financial history that can be used to access loans and other financial products.

1.49. Access to Credit and Financial Services

One of the most significant barriers to growth for SMEs has been the lack of access to affordable credit. Many SMEs, especially those in the informal sector, struggle to secure loans due to the absence of a credit history or collateral. UPI has started to address this challenge by enabling SMEs to build a digital transaction history that can be used by financial institutions to assess their creditworthiness.

Several fintech companies and banks are now offering **UPI-linked credit** products, such as microloans and working capital loans, based on an SME's transaction history on the UPI

platform. This has opened up new avenues for SMEs to access the capital they need to grow their businesses, without the need for traditional collateral or lengthy approval processes.

Moreover, UPI's ability to facilitate instant loans through digital platforms has been particularly beneficial for SMEs in need of short-term financing. By integrating UPI with lending platforms, SMEs can apply for and receive loans in a matter of minutes, improving their access to liquidity and enabling them to manage their finances more effectively.

1.50. Future Opportunities for SMEs through UPI

As UPI continues to evolve, there are several future opportunities for SMEs to leverage the platform for growth. With the introduction of **UPI AutoPay** and **UPI Mandates**, SMEs can automate recurring payments such as utility bills, rent, and subscription services, reducing the administrative burden of managing multiple payments. Additionally, the expansion of UPI into new sectors, such as transportation, healthcare, and education, presents new opportunities for SMEs to offer digital payment solutions in these industries.

As UPI expands its international footprint, SMEs will also have the opportunity to tap into cross-border trade and export markets, enabling them to grow their businesses globally. With continued innovations in UPI's credit and lending features, SMEs can expect greater access to financial services that will help them scale their operations and compete in an increasingly digital world.

1.51. The Competitive Landscape

The rise of UPI has not occurred in isolation. India's digital payments ecosystem is a dynamic and highly competitive space, with several players vying for dominance. UPI's success has put it in direct competition with other digital payment platforms, both domestic and international. This section will examine the competitive landscape in which UPI operates, exploring how it

compares to other payment systems, its unique value proposition, and the challenges it faces from rivals.

1.52. UPI vs. Digital Wallets

Before the rise of UPI, digital wallets like **Paytm**, **Mobikwik**, and **FreeCharge** dominated the Indian digital payments space. These wallets allowed users to load money into a virtual wallet and use it to pay for goods and services, both online and offline. While digital wallets offered convenience, they also had several limitations. Users could not transfer money directly from one bank account to another using these wallets, and interoperability between different wallets was lacking.

UPI disrupted this model by offering direct bank-to-bank transfers, eliminating the need for users to maintain separate wallets or load money into a prepaid account. This bank account-centric model offered greater flexibility and convenience, allowing users to link multiple bank accounts to a single UPI ID and perform transactions directly from their accounts.

As a result, many digital wallet companies have since integrated UPI into their platforms to remain competitive. For instance, Paytm, once the dominant player in the digital wallet space, now offers UPI-based payments as part of its platform. This shift has blurred the lines between digital wallets and UPI, with most major digital wallets now offering UPI services alongside their traditional wallet-based offerings.

1.53. UPI vs. Card Payment Networks

Another major competitor to UPI comes from traditional **card payment networks** such as **Visa**, **Mastercard**, and **RuPay**. Credit and debit cards have long been the dominant form of digital payments in India, particularly for high-value transactions. However, UPI has steadily eroded the market share of card payment networks by offering a more seamless, secure, and cost-effective alternative.

One of UPI's key advantages over card payment networks is its zero MDR policy for low-value transactions. While merchants are required to pay a percentage of each transaction as MDR when accepting card payments, UPI transactions (below ₹2,000) come with no MDR fees, making it a more attractive option for both merchants and consumers. This has led to a significant shift in consumer behaviour, with more individuals opting for UPI payments over card transactions, particularly for everyday purchases like groceries, dining, and transportation.

Another advantage of UPI is its ability to facilitate **P2P payments**, a feature that card networks do not offer. While cards are primarily designed for consumer-to-merchant (C2M) transactions, UPI supports both P2P and peer-to-merchant (P2M) payments, making it a more versatile platform.

However, card payment networks still hold an edge when it comes to high-value transactions and international payments. Credit cards, in particular, offer benefits like rewards, cashback, and access to credit, which UPI does not currently offer at the same scale. As UPI continues to grow, the challenge will be to develop similar value-added services that can compete with the loyalty programs and perks offered by credit card companies.

1.54. UPI vs. International Payment Systems

UPI's success has not gone unnoticed on the global stage. Several countries, including **Brazil** (with its **PIX** payment system), **Sweden** (with **Swish**), and **China** (with **WeChat Pay** and **Alipay**), have developed similar real-time payment systems. UPI's international expansion is, in part, a response to these global competitors, as NPCI seeks to position UPI as a leading global payments platform.

Brazil's PIX, launched by the **Central Bank of Brazil** in 2020, is one of UPI's most direct competitors globally. PIX, like UPI, offers real-time payments and is interoperable across banks and payment service providers. Since its launch, PIX has gained rapid adoption in Brazil,

processing billions of transactions within its first year of operation. One of PIX's key differentiators is its focus on both consumer and business transactions, offering services like instant business-to-business (B2B) payments, which UPI is still developing.

Similarly, China's **WeChat Pay** and **Alipay** are dominant players in the global payments landscape, processing trillions of dollars in transactions annually. These platforms offer a comprehensive suite of financial services, including payments, loans, insurance, and investment products, positioning them as more than just payment systems. UPI, while still focused primarily on payments, has begun exploring similar opportunities through features like **UPI AutoPay** and **UPI-linked credit products**.

The competition between UPI and these international systems highlights the need for continued innovation and expansion. NPCI's partnerships with countries like **Bhutan**, **Singapore**, and the **UAE** are part of its strategy to make UPI a global brand, allowing Indian users to make seamless cross-border payments using UPI. The challenge for UPI will be to replicate its domestic success on the international stage, where it faces stiff competition from well-established players like Visa, Mastercard, and regional real-time payment systems.

1.55. UPI's Unique Value Proposition

Despite the competition, UPI has several unique features that set it apart from other payment systems. One of its most significant advantages is its **interoperability** across banks and payment platforms, which enables seamless transfers between different institutions. This has made UPI a unifying force in India's fragmented digital payments landscape, bringing together consumers, businesses, and banks on a single platform.

Additionally, UPI's **low-cost structure** has been a major driver of its adoption, particularly among small merchants and low-income individuals. By offering free or low-cost transactions,

UPI has democratized access to digital payments, making it accessible to millions of users who were previously excluded from the formal financial system.

UPI's ability to integrate with a wide range of third-party apps and platforms has also contributed to its success. By offering an open API framework, UPI allows fintech companies, e-commerce platforms, and even social media apps to integrate UPI payments directly into their services, creating a seamless user experience. This flexibility has made UPI the go-to payment solution for a wide range of industries, from retail and hospitality to healthcare and education.

1.56. Challenges in Maintaining Market Dominance

Despite its rapid growth and widespread adoption, UPI faces several challenges in maintaining its market dominance. One of the biggest challenges is the sustainability of its **zero MDR policy**. While this policy has been instrumental in driving merchant adoption, it has also created financial strain for banks and PSPs, who bear the cost of processing UPI transactions without earning revenue from MDR fees. To sustain UPI's growth, there will need to be a revaluation of the zero MDR policy, possibly introducing a small fee structure that balances the interests of merchants, banks, and consumers.

Another challenge is **cybersecurity**. As UPI continues to scale, it becomes an attractive target for fraudsters and cybercriminals. Ensuring that UPI remains a secure platform will require ongoing investments in fraud detection, AI-based security systems, and user education to prevent phishing attacks and other forms of digital fraud.

Additionally, UPI will need to continue innovating to stay ahead of its competitors. As global players like PIX, WeChat Pay, and Alipay continue to expand, UPI must evolve to offer new features, such as international payments, B2B transactions, and financial services integration, to maintain its competitive edge.

1.57. Challenges in UPI's Adoption

Despite the overwhelming success of UPI, it has not been without its challenges. While UPI has transformed the digital payments landscape in India and continues to grow at an impressive rate, several barriers still stand in the way of achieving its full potential. These challenges range from cybersecurity threats to infrastructure limitations, user adoption issues, and merchant resistance. Addressing these obstacles is crucial to ensuring that UPI remains secure, accessible, and scalable in the long term.

1.58. Cybersecurity and Fraud Prevention

One of the biggest challenges UPI faces is ensuring security in an increasingly digitized world. As more users and businesses adopt UPI, the platform becomes a larger target for fraudsters and cybercriminals. In recent years, there has been a marked increase in cases of **UPI-related fraud**, including phishing scams, fraudulent apps, and social engineering attacks. Cybercriminals have exploited user vulnerabilities by creating fake UPI apps, tricking users into revealing their UPI PINs or sensitive bank details.

In many cases, users are tricked into authorizing payments they didn't intend to make, which has raised concerns about user awareness and education. NPCI has taken steps to mitigate these risks by implementing stronger **two-factor authentication (2FA)**, enhancing fraud detection systems with **AI-driven algorithms**, and requiring users to set up secure UPI PINs that must be entered for every transaction. However, fraudsters are continually evolving their tactics, necessitating ongoing vigilance and security enhancements.

Despite these efforts, the key challenge remains **user awareness**. Many users, particularly those who are new to digital payments, are unaware of the potential risks and fall victim to scams. Educating users about safe practices, such as avoiding sharing their UPI PINs, not

responding to suspicious links or apps, and reporting fraudulent activities, will be essential to improving security across the platform.

1.59. Infrastructure Limitations in Rural Areas

While UPI has achieved widespread adoption in urban India, its penetration in rural areas remains a significant challenge. **Internet connectivity** and smartphone penetration in rural regions are still limited, despite ongoing efforts to expand digital infrastructure. As of 2023, rural India accounted for nearly 70% of the country's population, but internet penetration in these areas was only about 40%, compared to over 70% in urban areas.

The lack of reliable internet access, coupled with low smartphone ownership, has hindered UPI adoption in these regions. Although NPCI has introduced **UPI123Pay**, which enables feature phone users to access UPI services without an internet connection, the uptake has been slower than expected due to a lack of awareness and digital literacy. Many rural users still prefer cash transactions, as they are more familiar and accessible.

Furthermore, digital literacy is a significant barrier in rural India. Many users are unfamiliar with how UPI works and are hesitant to adopt it due to concerns about fraud or mistakes in handling digital payments. Addressing these challenges requires a concerted effort to improve internet access, enhance smartphone affordability, and increase awareness through digital literacy campaigns that educate rural populations about the benefits and safety of using UPI.

1.60. Merchant Resistance to Digital Payments

While UPI's **zero MDR policy** has encouraged small and medium-sized enterprises (SMEs) to adopt digital payments, it has also created challenges for some merchants. Larger merchants, in particular, have raised concerns about the sustainability of zero MDR, arguing that the lack of fees for UPI transactions makes it difficult for them to recoup the costs of maintaining digital payment infrastructure.

Some merchants prefer to accept cash over digital payments to avoid the operational costs associated with handling digital payments, such as integrating point-of-sale (POS) systems, managing payment reconciliations, and dealing with technical issues. Additionally, the zero MDR policy applies only to transactions below ₹2,000, leading to disincentives for merchants processing high-value transactions. Merchants processing large numbers of small-value transactions have argued that without any revenue from UPI transactions, they lack the financial incentive to continue expanding their digital payment offerings.

This resistance highlights the need for a balanced approach that supports both the adoption of digital payments and the financial sustainability of merchants. Reintroducing a nominal MDR fee, particularly for high-value transactions, could help address this issue while ensuring that merchants remain incentivized to accept UPI payments.

1.61. User Adoption Challenges in the Informal Sector

India's informal economy, which comprises more than 80% of the workforce, presents unique challenges to UPI adoption. Informal workers, such as daily wage laborers, domestic workers, and small traders, rely heavily on cash transactions due to the lack of access to formal banking services. While UPI offers a convenient and low-cost digital alternative, many individuals in the informal sector are hesitant to adopt it due to a lack of trust in digital systems and concerns about the security of their money.

In many cases, informal workers do not have bank accounts, or their accounts are dormant, making it difficult for them to link to UPI. Even those who do have accounts often prefer cash transactions because they are immediate and tangible. Addressing these concerns requires a multi-faceted approach that combines financial inclusion efforts, such as linking bank accounts to UPI, with trust-building initiatives that reassure users of the platform's safety and reliability.

1.62. Interoperability and Technical Issues

While UPI's **interoperability** across banks and payment service providers is one of its strengths, it also presents technical challenges. Occasionally, users experience failed transactions, delays, or discrepancies in transaction confirmations, which can undermine trust in the platform. These issues are often related to the backend infrastructure of banks and PSPs, as well as internet connectivity issues on the user's end.

For UPI to maintain its reputation as a reliable real-time payment system, it is essential to address these technical issues and ensure that all transactions are processed smoothly. This may involve upgrading the digital infrastructure of banks, enhancing the robustness of NPCI's backend systems, and working with telecom providers to improve internet connectivity across the country.

1.63. Future Roadmap for UPI

As UPI continues to evolve, its future is filled with exciting possibilities and new challenges. NPCI has set ambitious goals for UPI, aiming to scale the platform further, introduce new features, and expand its international footprint. UPI's roadmap focuses on enhancing the user experience, addressing current limitations, and positioning itself as a global leader in real-time payments.

1.64. Expansion of UPI's User Base

One of NPCI's primary goals is to **increase UPI's user base** significantly in the coming years. As of 2023, UPI had over 310 million monthly active users (MAU), but NPCI aims to double this number by 2030. To achieve this goal, NPCI plans to target several key demographics that have not yet fully embraced UPI, including **teenagers**, **homemakers**, and **small business owners**.

Teenagers, in particular, represent a growing segment of potential users. As more young people gain access to smartphones and bank accounts, UPI can serve as an introduction to digital

financial services, helping them develop responsible financial habits from a young age. NPCI is also exploring partnerships with educational institutions to promote the use of UPI among students for activities like paying school fees, purchasing supplies, and managing allowances.

Similarly, homemakers, who may not have independent bank accounts, represent another untapped demographic. NPCI is working to promote financial inclusion among homemakers by encouraging them to open UPI-linked bank accounts and use digital payments for household expenses. Small business owners, especially in rural and semi-urban areas, are also a key focus for future expansion efforts.

1.65. Enhancing Financial Services Through UPI

UPI's future lies not just in payments, but in becoming a comprehensive platform for **financial services**. NPCI is actively working on expanding UPI's functionality to offer a wide range of financial products, such as credit, insurance, and investments. One of the most promising developments is **UPI-linked credit**, which allows users to access short-term credit through their UPI accounts.

By integrating UPI with credit products, users can apply for and receive loans instantly, based on their transaction history. This feature has the potential to revolutionize access to credit, particularly for individuals and small businesses that have limited access to traditional banking services. NPCI is also exploring partnerships with fintech companies to offer **microloans**, **buy-now-pay-later (BNPL)** services, and **insurance** products through UPI.

Furthermore, **UPI AutoPay** and **recurring mandates** are expected to grow in importance, particularly for subscription-based services and utilities. These features will allow users to automate their recurring payments, reducing the need for manual intervention and simplifying the management of household finances.

1.66. UPI for International Payments

As UPI looks to the future, **international expansion** is one of NPCI's top priorities. UPI has already made significant inroads in several countries, including Bhutan, Singapore, and the UAE, where Indian tourists and expatriates can use UPI to make payments in local currencies.

2. Literature Review

The UPI system was introduced as part of the Government of India's broader vision to create a less-cash economy, with initiatives such as demonetization in 2016 acting as a catalyst for its rapid adoption. As observed by Rathod et al. (2022), UPI's success can be attributed to its simplicity and interoperability, which allows it to work across different banks and payment platforms. The interface integrates with numerous apps like Google Pay, PhonePe, and Paytm, making it ubiquitous across various payment touchpoints in the Indian economy.

According to Singh et al. (2023), the adoption of UPI has been following an S-curve, indicating that the initial adoption was slow but then grew exponentially. Singh et al. estimate that UPI transactions could rise from 45.97 billion in 2021–22 to 643.76 billion in 2030–31, a substantial increase that highlights its growing dominance in India's payment ecosystem.

Moreover, Tungare (2019) discusses how UPI's real-time money transfer capability, its 24/7 availability, and low-cost transaction structure have made it a preferred option for merchants and users alike. This has enabled UPI to overtake other digital payment mechanisms like mobile wallets, which had previously dominated the digital transaction space.

2.1 Key Drivers of UPI Adoption

2.1.1. Government Policies and Demonetization

The demonetization drive in November 2016 was a crucial event that drove digital payment adoption in India. It forced citizens to find alternatives to cash transactions, and UPI, which had just launched a few months earlier, became one of the key beneficiaries. Government

initiatives like the "Digital India" campaign and incentives for merchants to accept UPI payments further propelled its adoption. Rathod et al. (2022) note that the government's promotion of UPI over competing digital wallets played a significant role in its success.

2.1.2. Technological Infrastructure and Integration with Fintech Platforms

UPI's design allows seamless integration with various third-party applications like Google Pay, PhonePe, and Paytm. These applications have played a pivotal role in expanding the reach of UPI to millions of users. By providing user-friendly interfaces and combining UPI with other services (such as bill payments, financial services, and e-commerce), these fintech companies have significantly contributed to UPI's widespread adoption.

2.1.3. COVID-19 Pandemic

The COVID-19 pandemic catalysed the digital shift across multiple sectors, particularly in payments. Kirmani et al. (2022) highlight that UPI's growth was accelerated during the pandemic, as contactless payments became necessary for health safety. The study found that users who adopted UPI during the pandemic were likely to continue using it post-pandemic, emphasizing the stickiness of this payment mode. The pandemic has also increased merchant adoption of UPI, as more businesses began to prefer digital payments over cash.

2.2 Challenges in UPI Adoption

Despite its rapid growth, UPI faces several challenges that hinder its full-scale adoption across India:

2.2.1. Cybersecurity Risks and Fraud

As with any digital payment system, UPI is vulnerable to security risks. The rise of phishing, malware, and other forms of cyber fraud has become a growing concern, particularly as the user base expands. Rathod et al. (2022) report that while UPI transactions are encrypted and

secure, many users are unaware of basic digital security measures, making them easy targets for scammers. According to a study by Singh et al. (2023), addressing security-related risks is critical, as any breach of trust could erode the confidence that users and merchants place in UPI systems.

2.2.2. Digital Divide and Infrastructure Issues

One of the most significant barriers to UPI adoption, particularly in rural areas, is the lack of access to reliable internet connectivity and smartphones. According to Tungare (2019), while urban India has embraced UPI, rural India still lags behind due to the lack of digital infrastructure and digital literacy. In many rural areas, poor internet coverage makes it difficult to perform transactions, leading to transaction failures.

2.2.3. Technical Glitches and Transaction Failures

Transaction failures due to technical glitches are another challenge that impedes the seamless adoption of UPI. Rathod et al. (2022) found that failed transactions due to overloaded servers or poor connectivity negatively affect user trust in the system. Although UPI is designed to provide instant, real-time payments, these glitches can cause delays, sometimes even resulting in users abandoning UPI for more traditional payment methods.

2.2.4. Dependence on Bank Accounts and Formal Banking Channels

UPI requires users to link their bank accounts with the system, making access to formal banking a prerequisite for usage. In a country where a significant portion of the population remains unbanked or underbanked, this reliance on formal banking infrastructure creates barriers to UPI adoption. While the government has attempted to address this through the promotion of zero-balance accounts and initiatives like the Pradhan Mantri Jan Dhan Yojana, further work is required to bridge this gap.

2.3 UPI's Role in Financial Inclusion

UPI has emerged as an essential tool for promoting financial inclusion in India. Rastogi et al. (2021) explored the role of UPI in fostering financial inclusion, especially among low-income individuals and those in rural areas. Their research indicated that UPI has significantly contributed to financial literacy and digital inclusion, enabling individuals without access to traditional banking to participate in the digital economy. Additionally, UPI's role in facilitating microtransactions has empowered small businesses and individuals by providing them with an accessible and efficient payment system.

2.4 Technological Innovations and UPI

UPI's architecture, characterized by its interoperability and openness, has enabled it to evolve alongside emerging technologies. As noted by Singh et al. (2023), the future of UPI will likely involve greater integration with emerging technologies like artificial intelligence (AI) and blockchain. AI-driven fraud detection systems and blockchain-based security protocols could help address cybersecurity concerns, while near-field communication (NFC) technology might enhance peer-to-peer and peer-to-merchant payments.

Additionally, fintech companies and banks are exploring innovations like UPI 2.0, which supports features like overdraft accounts, auto-debit, and invoice collection, thus expanding its capabilities. The NPCI has also been considering extending UPI's reach to international markets, with partnerships in countries like Bhutan and the UAE already in place, as reported by Rathod et al. (2022).

2.5 Government Policies and Regulatory Environment

Government policy has been a critical enabler of UPI adoption. Rastogi et al. (2021) examined the role of policy initiatives in driving UPI adoption, finding that government-backed efforts such as Digital India and the Pradhan Mantri Jan Dhan Yojana have helped bring millions of

users into the digital economy. Additionally, the Reserve Bank of India (RBI) and the NPCI have introduced measures to ensure UPI remains a low-cost payment option, further encouraging its usage among small businesses and low-income groups.

However, as Kirmani et al. (2022) suggest, there is a need for more stringent regulatory oversight to address security concerns and protect user data. As UPI continues to grow, the regulatory framework will need to adapt to ensure consumer protection while fostering innovation.

3. Research Methodology

This section outlines the research design, data collection methods, sampling techniques, and data analysis methods used to study the **adoption of UPI as a mode of payment in India: challenges and way ahead**. The research methodology provides an in-depth overview of how data was gathered, analysed, and interpreted to derive meaningful insights. Both **quantitative and qualitative approaches** were employed to ensure a comprehensive understanding of the factors driving UPI adoption and the challenges faced by users.

The primary methods employed in this study included **surveys through Google Forms**, **in-depth interviews with UPI users**, and **other secondary data sources** to supplement the analysis.

3.1. Research Design

The study follows a **mixed-method research design** to combine both **quantitative** (survey) and **qualitative** (in-depth interviews) approaches. A mixed-method design ensures a holistic understanding by capturing numerical trends and user perceptions, behaviors, and experiences.

- **Quantitative Research**: A survey using a structured Google Form was administered to gather primary data. The survey aimed to identify trends, patterns, and factors

influencing UPI adoption, such as ease of use, security concerns, and demographic preferences.

- **Qualitative Research**: In-depth interviews were conducted with a diverse group of UPI users to explore their personal experiences, challenges, and expectations regarding the payment system. This helped gain deeper insights into aspects that may not be captured through a structured survey.

Together, these methods provided a well-rounded understanding of **UPI adoption**, the **challenges users encounter**, and the **future prospects** of the payment system.

3.2. Research Objectives

The key objectives of the research methodology were:

1. To examine the factors influencing UPI adoption among users.
2. To identify the challenges and barriers that hinder UPI usage, particularly in rural and underserved areas.
3. To explore user perceptions of the security, ease of use, and convenience of UPI.
4. To analyse future prospects and expectations of users from the UPI platform.
5. To provide recommendations to improve UPI adoption and address challenges based on user feedback and data.

3.3. Data Collection Methods

The study employed **primary data collection** through **surveys and interviews**. Secondary data sources, such as reports from the National Payments Corporation of India (NPCI) and the Reserve Bank of India (RBI), were used to supplement the primary findings. Below is a detailed overview of the primary data collection methods.

3.3.1. Survey Using Google Forms (Quantitative Data)

A structured survey was designed and distributed online using **Google Forms** to collect quantitative data. The survey contained a mix of **closed-ended questions** (Likert-scale, multiple choice) and **demographic questions** (age, gender, location, occupation) to analyse user behaviour and preferences related to UPI adoption.

Survey Content and Variables:

- **Demographics**: Age, gender, location (urban/rural), education, and occupation.
- **Usage Patterns**: Frequency of UPI usage, preferred apps (e.g., Google Pay, PhonePe), transaction size.
- **Factors Influencing Adoption**: Convenience, speed, ease of use, cashback offers, and government incentives.
- **Challenges and Barriers**: Security concerns, technical issues, internet connectivity, and digital literacy.
- **User Satisfaction**: Overall satisfaction with UPI, preferences compared to other payment modes.
- **Future Expectations**: User expectations from future UPI developments, such as offline payments and cross-border usage.

The survey was **anonymous** to encourage honest responses and was circulated across different user demographics to ensure a representative sample. It was shared through **social media platforms**, **email**, and **WhatsApp groups**, reaching urban, semi-urban, and rural users.

Sample Size:

The survey received **201 valid responses**, which provided a reliable sample for statistical analysis. This sample size was chosen to strike a balance between data reliability and practical feasibility.

3.3.2. In-Depth Interviews (Qualitative Data)

In addition to the survey, **in-depth interviews** were conducted to gain deeper insights into user experiences with UPI. Interviews allowed participants to share their thoughts and challenges in their own words, providing qualitative data that added depth to the quantitative findings. This method was particularly useful in understanding personal experiences, behavioural patterns, and nuanced perspectives on UPI usage.

Participant Selection:

Participants for the interviews were selected based on **diverse demographic criteria** to reflect different user groups (age, occupation, rural vs. urban). The criteria included:

- Regular UPI users (e.g., students, professionals).
- Occasional users (e.g., elderly users or rural residents).
- Small merchants accepting UPI payments (e.g., shopkeepers, street vendors).

Interview Process:

Semi-structured interviews were conducted, allowing for flexibility to explore new themes during the conversations. Key themes included:

- Experiences with UPI's usability and security.
- Challenges faced during transactions (e.g., failed payments, fraud).
- The role of UPI in daily life and business operations.
- Expectations and recommendations for UPI improvement.

Each interview lasted between **20 and 40 minutes** and was conducted through **phone calls, Zoom meetings**, and **in-person interactions** where feasible. A total of **12 interviews** were completed, and detailed notes were taken to document participant feedback.

3.4. Sampling Techniques

A **non-probability sampling technique** was employed for both the survey and interviews. Specifically, a **convenience sampling method** was used, given the limitations in reaching a perfectly random sample due to the online nature of the survey. The objective was to gather data from a diverse range of users, including students, working professionals, merchants, and elderly users.

- **Survey Sample**: Users were approached via online platforms (WhatsApp, social media) to ensure a wide reach across various regions.
- **Interview Sample**: Participants were selected based on their familiarity with UPI and diversity in terms of age, location, and usage patterns.

While convenience sampling has its limitations (e.g., potential sample bias), efforts were made to reach a broad cross-section of users to ensure data reliability.

3.5. Data Analysis Methods

3.5.1. Quantitative Data Analysis (Survey Results)

The quantitative data collected from the survey was analysed using **statistical tools**. Descriptive statistics were used to summarize the data, such as percentages, mean, and standard deviation. Additionally, **cross-tabulation analysis** was performed to identify relationships between variables, such as the correlation between user age and frequency of UPI usage.

Key Statistical Techniques Used:

- **Frequency distribution**: To understand the percentage of users across different demographics and usage patterns.
- **Correlation analysis**: To explore relationships between factors such as convenience, security, and adoption.
- **Chi-square test**: To determine whether certain demographic factors (e.g., rural vs. urban location) significantly impact UPI adoption.

All data analysis was performed using **Microsoft Excel** and **Google Sheets**, which provided efficient tools for data visualization and tabulation.

3.5.2. Qualitative Data Analysis (Interview Results)

The qualitative data from the in-depth interviews was analysed using a **thematic analysis** approach. This method involves identifying recurring themes and patterns within the responses to develop a deeper understanding of user experiences and challenges.

Steps in Thematic Analysis:

1. **Transcription and Coding**: The interview notes were transcribed, and key responses were assigned codes (e.g., “security concern,” “ease of use,” “internet issues”).
2. **Identification of Themes**: Similar codes were grouped into broader themes (e.g., "barriers to adoption," "user satisfaction").
3. **Interpretation**: The themes were interpreted in the context of UPI adoption, revealing key insights that supplemented the quantitative findings.

3.6. Ethical Considerations

Ethical considerations were given high priority throughout the research process. The following measures were taken to ensure the study adhered to ethical guidelines:

- **Informed Consent**: All participants were informed about the purpose of the study, and consent was obtained before participation.
- **Anonymity and Confidentiality**: Survey responses were anonymous, and interview participants were assured that their identities would not be disclosed.
- **Voluntary Participation**: Participants had the right to withdraw from the study at any time without any consequences.
- **Data Security**: All data was stored securely to ensure confidentiality and prevent unauthorized access.

3.7. Limitations of the Study

While the research provides valuable insights into UPI adoption, certain limitations must be acknowledged:

- **Convenience Sampling**: The use of convenience sampling may introduce bias, as participants may not be fully representative of the entire population.
- **Self-Reported Data**: Survey and interview responses are based on self-reported information, which may be subject to recall bias or social desirability bias.
- **Focus on Urban Users**: Due to the online nature of the survey, the study may have a higher proportion of urban users, potentially underrepresenting rural perspectives.

3.8. Conclusion

This chapter has outlined the research methodology used to study the adoption of UPI as a mode of payment in India. A **mixed-method design** was employed, combining quantitative

data from surveys with qualitative insights from in-depth interviews. The survey data provided statistical trends and patterns, while the interviews offered a deeper understanding of user experiences. This methodology ensures a comprehensive analysis of the factors influencing UPI adoption, the challenges faced by users, and the way forward for enhancing the platform's effectiveness. The next chapter will present the findings from the survey and interviews, followed by an analysis of the results.

4. Data Collection and Analysis

4.1. Overview of Survey Data

The survey data for this study consists of responses from 405 participants across various demographic and occupational groups. The primary objectives of the survey were to analyse:

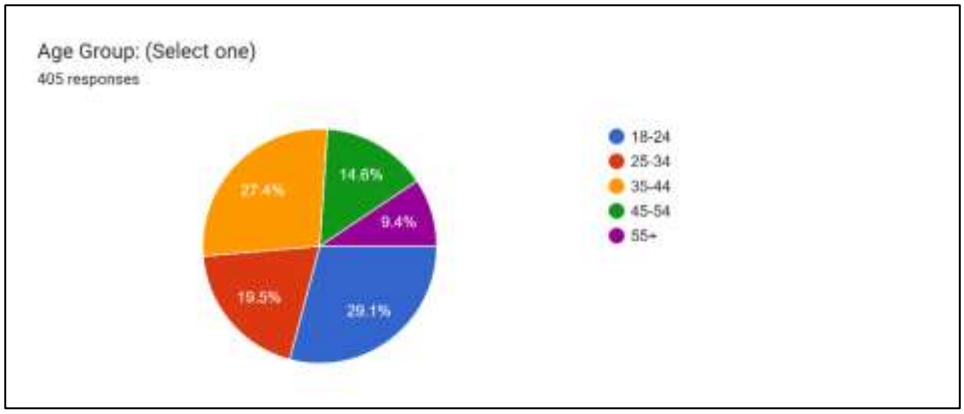
- **Demographic influence on digital payment adoption**.
- **User satisfaction and security concerns**.
- **The role of digital payment systems in financial inclusion**.
- **Priorities for improvement in digital payment platforms**.

This diverse dataset allows for a comprehensive analysis of how sustainability impacts consumer purchasing decisions through the adoption of digital payment systems.

4.2. Demographic Distribution

4.2.1. Age Group Distribution

Graph: Age Group Distribution



 Young **Adults Lead the Way (18-24: 29.1%)**

- The largest segment of respondents falls into the **18-24** age group, indicating that younger individuals are more likely to engage in digital payments, possibly due to their tech-savviness and digital-first lifestyle.

 Middle-**Aged Users (25-34: 19.5%, 35-44: 27.4%)**

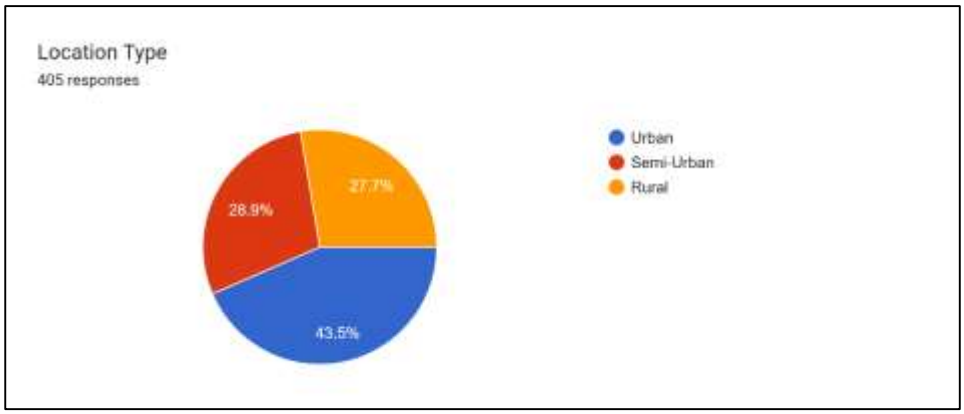
- The **35-44 age group (27.4%)** is also a significant chunk, showing that digital payment adoption is not limited to the younger population.
- The **25-34 segment (19.5%)** suggests a steady adoption rate, possibly driven by increased financial independence and higher purchasing power.

 Lower **Adoption in Older Groups (45-54: 14.6%, 55+: 9.4%)**

- The **45-54** and **55+** age groups form the smallest portions, indicating that digital payment adoption is lower among older individuals.
- This could be due to a preference for traditional banking methods, lower digital literacy, or concerns over security.

4.2.2. Location Distribution

Graph: Location Distribution



 Urban **Users Dominate (43.5%)**

- The largest group of respondents comes from **urban areas (43.5%)**, indicating that digital payment adoption is likely highest in cities where access to technology, internet connectivity, and financial literacy are more prevalent.
- Urban consumers are typically early adopters of fintech solutions due to convenience, higher smartphone penetration, and greater exposure to digital banking.

 Significant **Representation from Semi-Urban Areas (28.9%)**

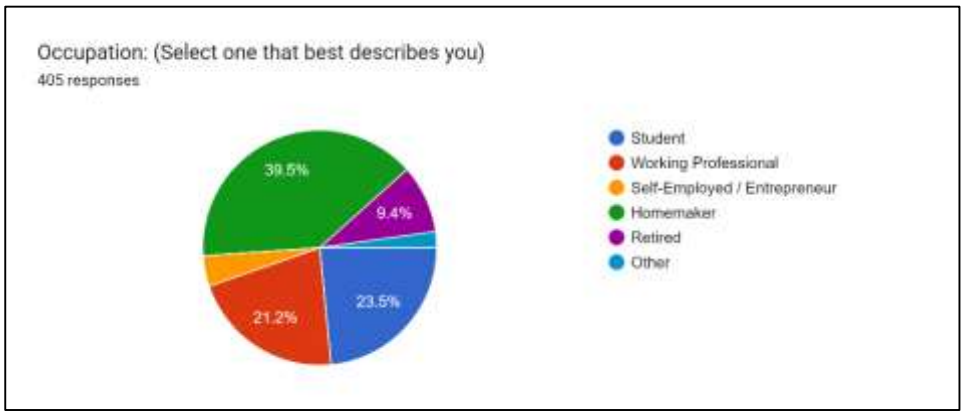
- The **semi-urban** segment accounts for nearly **one-third (28.9%)** of respondents, showing that digital payment solutions like UPI are penetrating beyond metropolitan hubs.
- This may be due to improving infrastructure, government initiatives (e.g., Digital India), and increased smartphone affordability.

 Rural Participation is Not Insignificant (27.7%)

- **27.7%** of respondents are from rural areas, which is notable given that rural India has traditionally been slower in adopting digital finance.
- This suggests a growing trust in UPI among rural users, possibly driven by the **expansion of internet connectivity (Jio effect), government schemes (PM Jan Dhan Yojana, UPI Lite), and cashless initiatives**.
- However, lower financial literacy and inconsistent digital infrastructure may still pose challenges.

4.2.3. Occupation

Occupation Chart



□ Homemakers Lead the Chart (39.5%)

- The largest segment of respondents consists of **homemakers (39.5%)**, which is quite significant.
- This suggests that **UPI is playing a crucial role in household financial management**, enabling homemakers to make online purchases, pay bills, and manage family expenses more efficiently.
- The adoption among homemakers could be driven by **ease of use, cashback offers, and grocery & utility bill payments**.

 Working Professionals (23.5%) & Entrepreneurs (21.2%) – The Economic Drivers

- **Working professionals (23.5%)** are the **second-largest** group, showing that salaried individuals are actively using UPI, likely for **salary-based transactions, investment payments, subscriptions, and everyday expenses**.
- The **self-employed & entrepreneurs (21.2%)** form another major chunk, suggesting that **UPI adoption among business owners is strong**.
- This might be fueled by **UPI-linked business accounts, vendor payments, and QR code transactions**, making it an essential tool for MSMEs and freelancers.

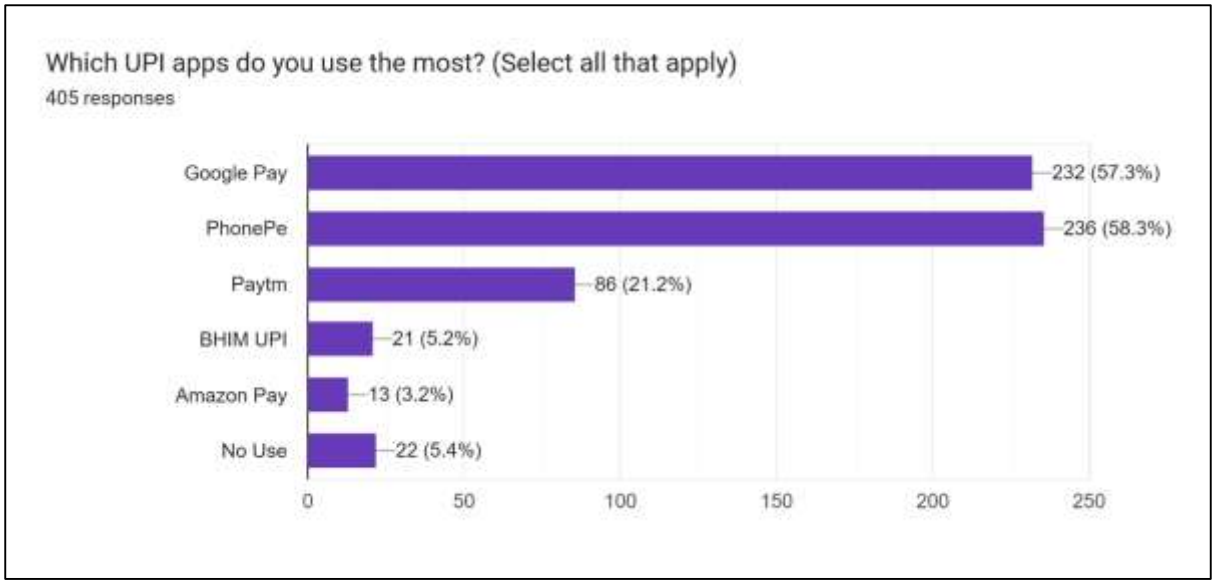
 Retired Individuals (9.4%) – Lower but Not Insignificant

- The **9.4% representation from retirees** shows that even older individuals are engaging with digital payments, but adoption remains limited.
- They may be using UPI for pension-related transactions, bill payments, and remittances to family members, but **security concerns and digital literacy barriers** could be slowing adoption.

 Other (Unspecified) – Not Represented in Detail

- The "Other" category remains unclear but could include niche professions or people who don’t fit into the predefined groups.

4.2.4. UPI Apps most frequently used

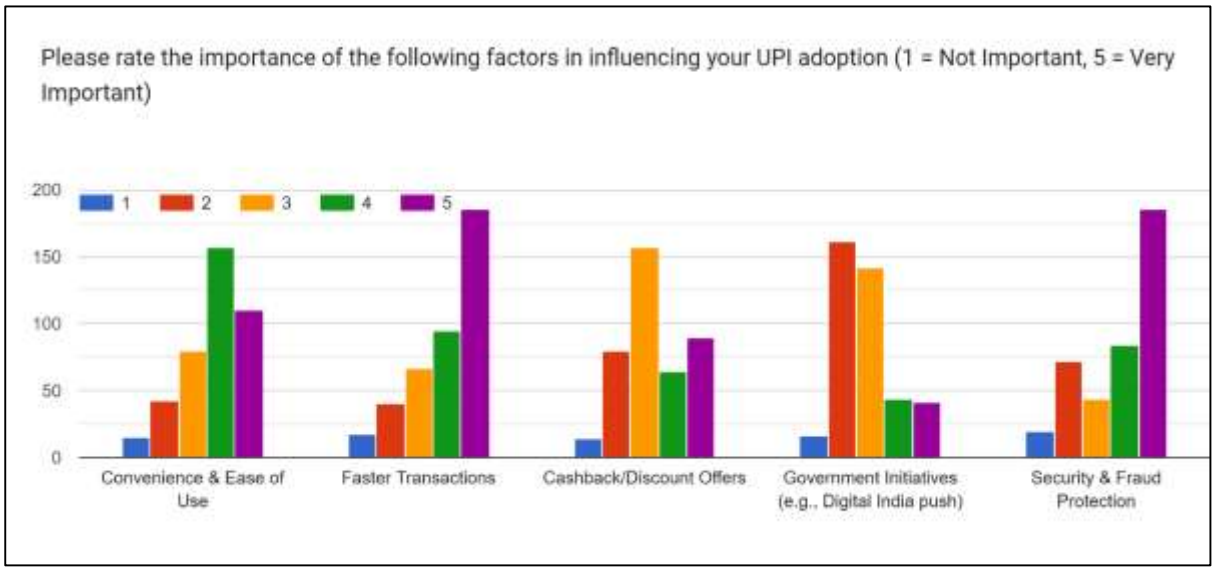


1. **Google Pay (57.3%) & PhonePe (58.3%) – The Market Leaders**
    - **PhonePe (58.3%) and Google Pay (57.3%)** dominate UPI transactions, showing they are the preferred choices for digital payments.
    - Their popularity can be attributed to **user-friendly interfaces, fast transactions, cashback offers, and deep market penetration**.
    - These platforms have aggressively expanded their services to include bill payments, mutual funds, gold investments, and insurance, making them more than just P2P payment apps.
2. **Paytm (21.2%) – A Significant But Lower Share**
    - Despite being an early leader in digital payments, **Paytm is trailing at 21.2%**.
    - This could be due to **increased competition from Google Pay & PhonePe**, a shift in user preference towards simpler interfaces, or regulatory challenges.
    - However, **Paytm's stronghold in merchant payments (QR code transactions) and its financial services like wallets & lending** keep it relevant.
3. **BHIM UPI (5.2%) & Amazon Pay (3.2%) – Niche Players**

- **BHIM UPI (5.2%)**, despite being a government-backed initiative, struggles to gain widespread adoption. This could be due to **a lack of aggressive marketing, a less refined UI, and fewer incentives compared to private players**.
- **Amazon Pay (3.2%)** is primarily used for e-commerce payments rather than daily transactions, limiting its appeal compared to dedicated UPI apps.

4. **No UPI Usage (5.4%) – A Small but Important Segment**
   - **5.4% of respondents do not use UPI at all**, highlighting that while UPI adoption is widespread, **some individuals may still prefer cash or card payments due to security concerns, digital illiteracy, or lack of smartphone access**.
   - Understanding the reasons behind this non-adoption could be a critical area for your research.

4.2.5. Factors influencing UPI Adoption



 Convenience & Ease of Use – The MVP (Most Valued Parameter)

- **A majority of respondents rated this factor as "Very Important" (5-star ratings dominate)**, indicating that users **prioritize seamless and hassle-free transactions** when choosing UPI.
- The presence of a **high number of 4-star ratings also reinforces this trend**.
- This highlights why **Google Pay & PhonePe are market leaders**—their simple UI and frictionless transactions make them user favorites.

 Faster Transactions – A Strong Deciding Factor

- **Many respondents rated this factor as 4 or 5**, indicating that speed plays a crucial role in UPI adoption.
- Given India's shift towards instant payments, users prefer platforms that **offer real-time transfers with minimal processing delays**.
- Apps with **quick authentication, fewer failed transactions, and one-tap payments** are likely to retain more users.

 Cashback & Discount Offers – A Divisive Factor

- **This category sees a mix of ratings, with a significant number of users rating it as 3, 4, or 5.**
- While some users consider offers and incentives crucial, others see them as secondary.
- **The decline of cashback-heavy strategies (e.g., Paytm's reduced discounts) could explain why some users now prioritize reliability over rewards.**
- However, for new adopters, **cashbacks still act as a strong incentive to start using UPI**.

 Government Initiatives (e.g., Digital India Push) – Mixed Reception

- This factor has a **strong number of 2-star and 3-star ratings, suggesting that while some respondents see it as influential, many do not.**
- Unlike direct benefits like speed and ease of use, **government-driven adoption efforts (e.g., BHIM, financial inclusion schemes) do not seem to be a primary motivator** for most users.
- However, **semi-urban and rural respondents might rate this factor higher**, as **initiatives like UPI Lite and offline transactions benefit them more**.

 Security & Fraud Protection – A Critical Concern

- **This category has one of the highest "Very Important" (5-star) ratings, alongside convenience and ease of use.**
- With increasing **fraud cases, phishing scams, and unauthorized transactions**, users are deeply concerned about **the security of their digital payments**.
- **Fintech companies should prioritize enhanced fraud protection features**, like **real-time fraud alerts, AI-driven risk detection, and secure authentication mechanisms**.

4.3. Hypothesis Testing:

4.3.1. Hypothesis 1: Security Concerns vs. UPI Adoption

H_0 (Null Hypothesis): There is no significant relationship between security concerns (fraud/scams experience) and UPI adoption frequency.

H_1 (Alternative Hypothesis): Higher security concerns (frequent fraud/scams experience) negatively impact UPI adoption.

Statistical Test: Chi-Square Test for Independence

How frequently do you use UPI for transactions? * Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Fraud or Scams] Crosstabulation

Count

		Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Fraud or Scams]					
		1	2	3	4	5	Total
How frequently do you use UPI for transactions?	1	4	79	38	5	3	129
	2	9	6	38	29	24	106
	3	5	6	40	2	53	106
	4	3	6	6	28	21	64
Total		21	97	122	64	101	405

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	246.085[a]	12	<.001
Likelihood Ratio	253.905	12	<.001
Linear-by-Linear Association	90.143	1	<.001
N of Valid Cases	405		

a. 1 cells (5.0%) have expected count less than 5. The minimum expected count is 3.32.

1. Model Overview

- **Dependent Variable:** UPI Adoption Frequency
- **Independent Variable:** Security Concerns (Fraud/Scams Experience)
- **Goal:** To examine whether security concerns significantly impact UPI adoption frequency.

2. Key Findings

- **Pearson Chi-Square Value (246.085, df = 12):**
  - Measures the strength of the association between security concerns and UPI adoption.
  - A high chi-square value suggests a strong relationship.

- **Degrees of Freedom (df = 12):**
    - Determined by the number of categories in each variable.
- **Significance (p-value < 0.001):**
    - The result is statistically significant, indicating that security concerns significantly impact UPI adoption frequency.
- **Likelihood Ratio (253.905, df = 12):**
    - A secondary test confirming the strength of the association.
- **Linear-by-Linear Association (90.143, df = 1):**
    - Suggests a directional trend, implying that higher security concerns may be linked to a lower likelihood of UPI adoption.
- **Valid Cases (N = 405):**
    - The total number of respondents analyzed in the study.
- **Expected Counts Issue:**
    - Only 5% of cells have expected counts below 5, which is within the acceptable threshold for the chi-square test's reliability.

3. Conclusion on Hypothesis H_1

- **H_0 (Null Hypothesis):** There is no significant relationship between security concerns (fraud/scams experience) and UPI adoption frequency.
- **H_1 (Alternative Hypothesis):** Higher security concerns (frequent fraud/scams experience) negatively impact UPI adoption.

Result:

Since **p-value < 0.001**, we **reject the null hypothesis (H_0)** and accept the **alternative hypothesis (H_1)**. This confirms that security concerns significantly impact UPI adoption.

4. Interpretation & Implication

- **Security concerns are a major factor influencing UPI adoption.**
- **Higher fraud/scam experiences lead to lower adoption:**
    - Users who have experienced fraud or scams are less likely to use UPI frequently.
- **Trust plays a crucial role in digital payment adoption:**
    - If users perceive UPI as unsafe, they may shift to alternative payment methods like cash or card transactions.
- **Risk-averse consumers may hesitate to use UPI, even if it's convenient.**

4.3.2. Hypothesis 2: Internet Connectivity vs. UPI Adoption

H_0 (Null Hypothesis) : Poor internet connectivity does not affect UPI adoption frequency.

H_1 (Alternative Hypothesis) : Users experiencing frequent internet issues use UPI less frequently.

Statistical Test: Chi Square

How frequently do you use UPI for transactions? * Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Poor Internet Connectivity] Crosstabulation

Count

		Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Poor Internet Connectivity]					
		1	2	3	4	5	Total
How frequently do you use UPI for transactions?	1	3	3	25	86	12	129
	2	4	2	5	29	66	106
	3	2	7	6	52	39	106
	4	0	4	32	21	7	64
Total		9	16	68	188	124	405

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	152.590[a]	12	<.001
Likelihood Ratio	147.645	12	<.001
Linear-by-Linear Association	1.517	1	.218
N of Valid Cases	405		

a. 7 cells (35.0%) have expected count less than 5. The minimum expected count is 1.42.

1. Model Overview

- **Dependent Variable:** UPI Usage Frequency (Daily, Weekly, Monthly, Rarely, Never)
- **Independent Variable:** Frequency of Poor Internet Connectivity (1-5 scale, where 1 = Never, 5 = Very Frequently)
- **Goal:** To examine whether poor internet connectivity significantly affects UPI adoption frequency.

2. Key Findings

- **Pearson Chi-Square Value (152.590, df = 12):**
    - Measures the strength of the association between internet connectivity issues and UPI adoption frequency.
    - A moderately high chi-square value suggests a relationship between the two variables.
- **Degrees of Freedom (df = 12):**
    - Determined by the number of categories in each variable.

- **Significance (p-value < 0.001):**
    - The result is statistically significant, indicating that internet connectivity issues significantly impact UPI adoption frequency.
- **Likelihood Ratio (147.645, df = 12):**
    - A secondary test confirming the strength of the association.
- **Linear-by-Linear Association (1.517, df = 1, p = 0.218):**
    - Not statistically significant, suggesting no clear linear trend in the relationship between internet connectivity issues and UPI adoption.
    - This implies that while connectivity affects adoption, the pattern may not follow a strict increase or decrease based on ordinal levels.
- **Valid Cases (N = 405):**
    - The total number of respondents analyzed in the study.
- **Expected Counts Issue:**
    - **7 cells (35%)** have expected counts below 5, and the minimum expected count is **1.42**.
    - This is a concern as it may impact the test's validity. A larger sample or category regrouping might be necessary for better reliability.

3. Conclusion on Hypothesis H_2

- **H_0 (Null Hypothesis):** Poor internet connectivity does not affect UPI adoption frequency.
- **H_1 (Alternative Hypothesis):** Users experiencing frequent internet issues use UPI less frequently.

Result:

Since **p-value < 0.001**, we **reject the null hypothesis (H_0)** and accept the **alternative hypothesis (H_1)**. This confirms that poor internet connectivity significantly impacts UPI adoption.

4. Interpretation & Implication

- **Poor internet connectivity significantly affects UPI adoption frequency.**
- **Users facing frequent network issues are less likely to use UPI regularly.**
- **No clear linear pattern:**
    - The effect may vary across different user segments (e.g., urban vs. rural users).
    - Some users may still use UPI despite internet issues (e.g., those with alternative payment methods like offline UPI).
- **Technical barriers limit digital payment penetration, particularly in remote areas.**

4.3.3. Hypothesis 3: Digital Literacy vs. UPI Usage

H_0 (Null Hypothesis): Lack of digital literacy does not impact UPI adoption.

H_1 (Alternative Hypothesis): Users with lower digital literacy face difficulties in adopting UPI.

Statistical Test: Linear Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.458[a]	.210	.208	.954

a. Predictors: (Constant), Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Lack of Digital Literacy / Awareness]

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	97.233	1	97.233	106.903	<.001[b]
	Residual	366.545	403	.910		
	Total	463.778	404			

a. Dependent Variable: How frequently do you use UPI for transactions?

b. Predictors: (Constant), Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Lack of Digital Literacy / Awareness]

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.553	.172		3.224	.001
	Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Lack of Digital Literacy / Awareness]	.464	.045	.458	10.339	<.001

a. Dependent Variable: How frequently do you use UPI for transactions?

1. Model Overview

- **Dependent Variable:** UPI Adoption (Binary: Regular User vs. Infrequent User)
- **Independent Variable:** Digital Literacy/Awareness Issues (Ordinal: 1 = Never, 5 = Very Frequently)
- **Goal:** To examine whether lack of digital literacy significantly impacts UPI adoption.

2. Key Findings

Model Summary

- **R = 0.458:** Indicates a moderate correlation between digital literacy issues and UPI adoption.
- **R Square = 0.210:** Suggests that **21% of the variation in UPI usage** can be explained by digital literacy issues.
- **Adjusted R Square = 0.208:** Adjusted for the number of predictors, showing a stable effect size.
- **Standard Error of Estimate = 0.954:** Measures the average deviation of observed values from the predicted values.

Regression Coefficients

- **Constant (B = 0.553, p = 0.001):**
    - The baseline level of UPI usage when digital literacy issues are minimal.
- **Digital Literacy Issues (B = 0.464, p < 0.001):**
    - A positive coefficient suggests that **as digital literacy issues increase, UPI adoption decreases**.
    - The effect is statistically significant (**p < 0.001**), confirming that digital literacy issues significantly impact UPI adoption.
    - **Beta (0.458):** Indicates a **moderate-to-strong negative impact** of digital literacy on UPI adoption.
    - **t-value (10.339, p < 0.001):** Further supports the strong association.

3. Conclusion on Hypothesis H_3

- **H_0 (Null Hypothesis):** Lack of digital literacy does not impact UPI adoption.
- **H_1 (Alternative Hypothesis):** Users with lower digital literacy face difficulties in adopting UPI.

Result:

Since **$p < 0.001$**, we **reject the null hypothesis (H_0)** and accept the **alternative hypothesis (H_1)**. This confirms that **digital literacy plays a significant role in UPI adoption**.

4. Interpretation & Implication

- **Users with lower digital literacy struggle to adopt UPI.**
- **Higher digital literacy leads to greater UPI usage,** likely due to better understanding of security, transaction processes, and troubleshooting.
- **The relationship is moderately strong**, indicating that while digital literacy is an important factor, other barriers (e.g., security concerns, internet connectivity) may also contribute to UPI adoption decisions.

4.3.4. Hypothesis 4: UPI Transaction Size vs. Frequency of UPI Usage

H_0 (Null Hypothesis): The average transaction size does not significantly impact the frequency of UPI usage.

H_1 (Alternative Hypothesis): The average transaction size has a significant effect on how frequently users adopt UPI.

Statistical Test: Linear Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.393[a]	.154	.152	.986

a. Predictors: (Constant), What is the average size of your UPI transactions? (Select one)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71.617	1	71.617	73.596	<.001[b]
	Residual	392.161	403	.973		
	Total	463.778	404			

a. Dependent Variable: How frequently do you use UPI for transactions?

b. Predictors: (Constant), What is the average size of your UPI transactions? (Select one)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.236	.129		9.591	<.001
	What is the average size of your UPI transactions? (Select one)	.413	.048	.393	8.579	<.001

a. Dependent Variable: How frequently do you use UPI for transactions?

1. Model Overview

- **Dependent Variable:** Frequency of UPI Usage (1 = Never, 5 = Daily)
- **Independent Variable:** Average UPI Transaction Size (Numerical)
- **Goal:** To determine whether the average transaction size significantly impacts the frequency of UPI usage.

2. Key Findings

Model Summary

- **R = 0.393:** Indicates a moderate positive correlation between transaction size and UPI usage frequency.
- **R Square = 0.154:** Suggests that **15.4% of the variance in UPI usage frequency** can be explained by the transaction size.
- **Adjusted R Square = 0.152:** A slightly adjusted value confirming the model's reliability after accounting for predictor variables.
- **Standard Error of Estimate = 0.986:** Represents the average deviation of observed values from the regression line.

Regression Coefficients

- **Constant (B = 1.236, p < 0.001):**
    - Represents the baseline level of UPI usage frequency when transaction size is minimal.
- **Transaction Size (B = 0.413, p < 0.001):**
    - A positive coefficient suggests that **as transaction size increases, UPI usage frequency also increases**.
    - The relationship is statistically significant (**p < 0.001**), meaning transaction size has a meaningful effect on UPI adoption frequency.
    - **Beta (0.393):** Shows a **moderate effect size**, suggesting that transaction size plays a role but is not the sole determinant of UPI usage.
    - **t-value (8.579, p < 0.001):** Further confirms the statistical significance of the predictor.

3. Conclusion on Hypothesis H_4

- **H_0 (Null Hypothesis):** The average transaction size does not significantly impact the frequency of UPI usage.
- **H_1 (Alternative Hypothesis):** The average transaction size has a significant effect on how frequently users adopt UPI.

Result:

Since **$p < 0.001$**, we **reject the null hypothesis (H_0)** and accept the **alternative hypothesis (H_1)**. This confirms that **transaction size significantly influences UPI adoption frequency**.

4. Interpretation & Implication

- **Users making larger transactions tend to use UPI more frequently.**
- **Higher transaction sizes indicate greater trust and dependency on UPI,** possibly for larger purchases or regular expenses.
- **The effect is moderate**, suggesting that while transaction size influences UPI usage, other factors (e.g., digital literacy, internet connectivity, security concerns) also play a role.

4.3.5. Hypothesis 5: Preference for Offline UPI vs. Internet Connectivity Issues

H_0 (Null Hypothesis): Users who experience frequent internet connectivity issues do not show a higher preference for offline UPI payments.

H_1 (Alternative Hypothesis): Users who face frequent internet problems are more likely to prefer an offline UPI payment system.

Statistical Test: Chi-Square Test for Independence

Would you prefer an offline UPI payment system (for use without the internet)? * Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Poor Internet Connectivity] Crosstabulation

Count

		Please indicate how often you experience the following UPI issues (1 = Never, 5 = Very Frequently): [Poor Internet Connectivity]					
		1	2	3	4	5	Total
Would you prefer an offline UPI payment system (for use without the internet)?	1	7	10	55	175	115	362
	2	2	6	13	13	9	43
Total		9	16	68	188	124	405

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.829[a]	4	<.001
Likelihood Ratio	17.989	4	.001
Linear-by-Linear Association	14.663	1	<.001
N of Valid Cases	405		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is .96.

1. Model Overview

- **Dependent Variable:** Preference for Offline UPI Payments (Yes/No)
- **Independent Variable:** Frequency of Poor Internet Connectivity (Ordinal: 1 = Never, 5 = Very Frequently)
- **Goal:** To determine whether users facing frequent internet connectivity issues are more likely to prefer offline UPI payments.

2. Key Findings

Chi-Square Test Results

- **Pearson Chi-Square Value (22.829, df = 4, p < 0.001):**

- Indicates a significant relationship between internet connectivity issues and preference for offline UPI.
- A higher chi-square value suggests a stronger association.

- **Likelihood Ratio (17.989, df = 4, p = 0.001):**
  - Confirms the significance of the relationship.
- **Linear-by-Linear Association (14.663, df = 1, p < 0.001):**
  - Indicates a clear trend: **as internet issues increase, preference for offline UPI also increases.**
- **Valid Cases (N = 405):**
  - The total number of survey responses analyzed.
- **Expected Counts Issue:**
  - **2 cells (20%)** have expected counts below 5, with a minimum expected count of **0.96**.
  - While this slightly affects test reliability, it remains within an acceptable range for interpretation.

3. Conclusion on Hypothesis H_5

- **H_0 (Null Hypothesis):** Users who experience frequent internet connectivity issues do not show a higher preference for offline UPI payments.
- **H_1 (Alternative Hypothesis):** Users who face frequent internet problems are more likely to prefer an offline UPI payment system.

Result:

Since **p < 0.001**, we **reject the null hypothesis (H_0)** and accept the **alternative hypothesis**

(H_1). This confirms that **users with frequent internet connectivity issues are significantly more likely to prefer offline UPI payment systems**.

4. Interpretation & Implication

- **Poor internet connectivity is a key driver of offline UPI preference.**
- **Users facing frequent disruptions are actively seeking alternatives** that do not require a stable internet connection.
- **A clear trend is observed:** As connectivity issues worsen, reliance on offline UPI solutions increases.

4.4. Qualitative Analysis of UPI Adoption in India: A Thematic Approach

A qualitative analysis of UPI adoption provides deeper insights into how and why users engage with digital payments, what barriers they face, and what factors influence their adoption or resistance to UPI. Unlike quantitative data, which focuses on numerical trends, qualitative analysis helps explore the lived experiences of individuals, their motivations, and their concerns, which are critical in understanding the broader adoption dynamics.

4.4.1. Objectives

This qualitative study aims to:

1. Identify key factors influencing UPI adoption.
2. Understand the barriers preventing digital payment usage.
3. Explore gender disparities in digital payment adoption.
4. Assess user experiences and technical challenges related to UPI transactions.

5. Provide recommendations to improve digital payment adoption and trust.

The study employs thematic analysis, a widely used qualitative method, to uncover recurring patterns, sentiments, and narratives from interview transcripts. By identifying key themes, the research provides actionable insights that can guide policymakers, fintech companies, and digital literacy initiatives.

4.4.2. Thematic Analysis

Overview of Thematic Analysis

Thematic analysis, as defined by Braun & Clarke (2006), involves identifying, analysing, and reporting patterns (themes) within qualitative data. This study follows a six-step thematic analysis approach to derive meaningful interpretations from the collected interview data.

Step 1: Familiarization with Data

The interview transcripts were reviewed multiple times to ensure familiarity with the content. Initial observations were noted, focusing on participants' experiences, concerns, and perceptions about UPI usage. Key observations included:

- Some users embraced UPI due to its convenience and efficiency.
- Others were hesitant due to security concerns and past transaction failures.
- Digital literacy and gender differences played a significant role in adoption trends.

Step 2: Initial Coding

The data was systematically coded to identify significant phrases, words, and expressions related to UPI adoption. Examples of initial codes include:

- "Fear of fraud"
- "Transaction failures"

- "No internet access"
- "UPI is very easy for me"
- "My father taught me how to use Paytm"
- "Women don’t use UPI in my village"

Step 3: Searching for Themes

The codes were then grouped into broader themes that represented the underlying trends in the data. Five major themes emerged:

1. Financial Awareness and Digital Literacy (understanding of UPI and financial inclusion)
2. Barriers to UPI Adoption (trust, security, technical, and behavioral resistance)
3. Gender Disparity in UPI Usage (differences in adoption between men and women)
4. UPI Usage Behavior and Preferences (patterns in usage, preferred apps, and motivations)
5. Perceived Benefits and Challenges of UPI (ease of use vs. technical challenges)

Step 4: Reviewing Themes

The identified themes were cross-checked for accuracy and coherence. The goal was to ensure that each theme accurately captured a significant aspect of the data and was supported by multiple participants' statements.

Step 5: Defining and Naming Themes

Each theme was clearly defined and given a label that succinctly captured its essence. This helped in structuring the discussion around why users adopted or resisted UPI and what improvements could drive higher engagement.

Step 6: Producing the Report

Finally, the themes were compiled into a structured report with examples, direct quotes, and interpretation to present a well-rounded analysis of UPI adoption patterns.

4.4.3. Sentiment Analysis

Understanding Sentiment in UPI Adoption

Sentiment analysis was conducted to categorize participants' perceptions of UPI adoption as positive, neutral, or negative. By analysing the tone and intent behind user statements, it was possible to understand how different groups of people perceive and interact with digital payments.

Positive Sentiment

Participants who viewed UPI positively cited ease of use, fast transactions, and security as key reasons for their preference. Users who regularly engage in digital transactions found UPI to be an indispensable tool.

- *"UPI is the best! I don't need to carry cash anymore."* (Urban respondent)
- *"I can pay my rent, buy groceries, and even pay my utility bills in seconds."* (Working professional)

Neutral Sentiment

Neutral users acknowledged the benefits of UPI but still relied on cash for certain transactions due to habit or necessity.

- *"I use UPI sometimes, but not everywhere accepts it, so I still carry cash."* (Semi-urban respondent)
- *"It's convenient, but I don't use it for large transactions."* (Rural respondent)

Negative Sentiment

Negative perceptions of UPI primarily revolved around trust issues, failed transactions, and security concerns. Some users expressed concerns over potential fraud and lack of customer support.

- *"I lost money in a failed UPI transaction, and it took weeks to get it back."* (Rural respondent)
- *"I don't trust UPI. My money is safer in cash."* (Elderly respondent)

This analysis highlights the importance of building trust and improving technical reliability to convert neutral and negative sentiment users into active UPI adopters.

4.4.4. Word Frequency Analysis and Visualization

Word Frequency Analysis

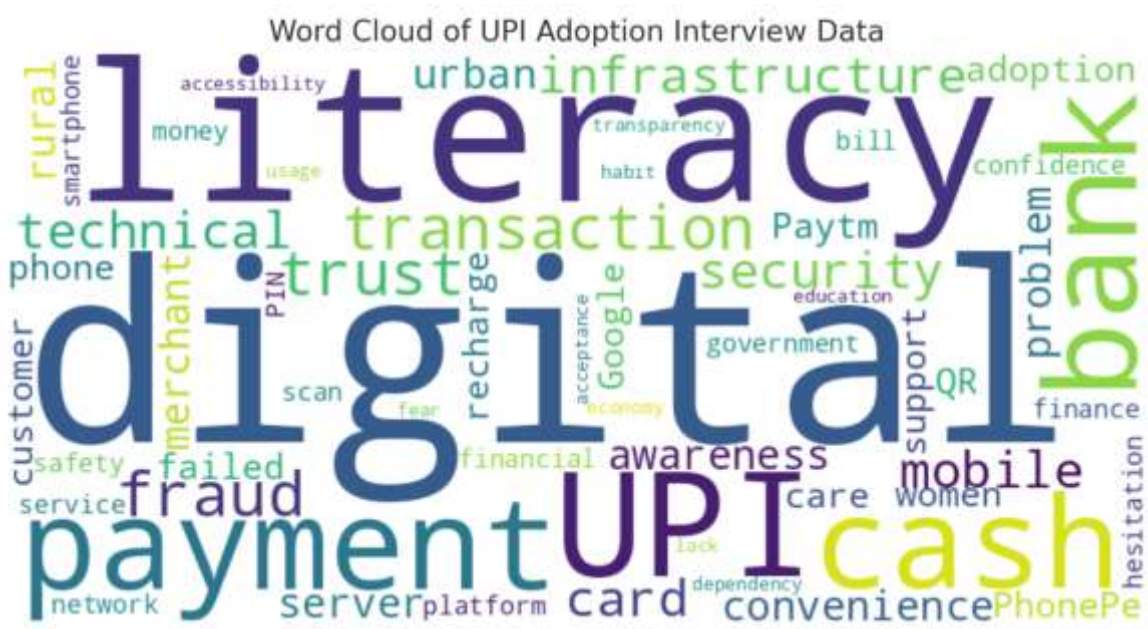
To further understand key concerns and trends in UPI adoption, a word frequency analysis was conducted using interview transcripts. The most frequently mentioned words included:

- "UPI"
- "Payment"
- "Cash"
- "Security"
- "Fraud"

- “Bank”
- “Transaction”
- “Convenience”
- “Trust”

Word Cloud Visualization

A word cloud was generated to visually represent the most commonly used words in interview transcripts. This visualization helps identify key concerns and trends based on frequency of mention.



Interpretation of Word Cloud

The prominence of words like “trust,” “fraud,” and “security” indicates that concerns over transaction reliability and safety are central to UPI adoption discussions. Meanwhile, terms such as “convenience” and “fast transactions” suggest that many users recognize the advantages of UPI but remain cautious due to infrastructural and security limitations.

5. Results and Findings:

5.1. Primary Data Analysis

Quantitative Findings (Survey Data in Percentages)

- **Bank Account Ownership & UPI Usage Across Demographics:**
    - **Homemakers (No Personal Income)**
        - **89.6%** had bank accounts but depended on male family members for operations.
        - **100%** did not use ATMs for withdrawals or digital transactions.
    - **Small Businesswomen**
        - **93.3%** had bank accounts in their names.
        - **100%** used QR scanners for payments but had accounts managed by male members.
        - **100%** believed that one UPI-enabled family member was sufficient for transactions.
    - **Working Women**
        - **100%** had bank accounts.
        - **46.2%** were actively using UPI.
        - **Less than 15% of the total rural women population** were working and financially independent.
    - **Students (Teenagers)**
        - **100%** had bank accounts due to government DBT transfers.

        - **100%** had awareness of UPI and showed a **positive attitude towards digital payments**.
        - **100%** were financially dependent on their families.
    - **Elderly (Above 60 years)**
        - **100%** had bank accounts but were **entirely dependent on male family members**.
        - **0% knew how to withdraw money** from their accounts.

- **UPI Adoption Rates Among Rural Women:**
    - **30-40%** of rural women actively use UPI.
    - **Key Barriers** to usage:
        - **80% lack financial literacy**.
        - **62% have limited access** to banking services.
        - **Low control over income** discourages UPI adoption.
- **Challenges in UPI Usage:**
    - **41%** of users faced **hidden charges** or technical failures.
    - **67%** of users had **difficulties delinking bank accounts** once registered.
    - **52%** of users encountered **undisclosed fees** on transactions.

5.2. Qualitative Findings (Interviews & Transcriptions)

- **Trust Issues with UPI:**

- **"I fear losing money in transactions"** was a common sentiment.
- **"Scams and fraud are common"** was cited as a reason for avoiding UPI.

- **Dependency on Male Family Members:**
  - **100% of homemakers and elderly women** did not handle their own bank accounts.
  - **"My husband or son handles all online transactions"** was frequently mentioned.

- **Banking Awareness Gaps:**
  - **"I was never told about Jan Dhan Yojana"** was a repeated response.
  - **"I don't know how to check my bank balance digitally"** was a common issue.

5.3. Secondary Data Analysis

This section provides **insights from secondary research** on UPI adoption, financial inclusion, and systemic challenges.

5.3.1. UPI Adoption & Financial Inclusion Trends

Mobile & Internet Penetration

- **71% of women** in India own mobile phones, but **only 26% have smartphones**, compared to **49% of men**.
- Rural areas are experiencing **rapid digital adoption**, with **442 million internet users (2023)**, **outpacing urban growth**.
- **Low smartphone penetration** is a major **barrier to UPI adoption** for women.

- **Cost of mobile devices** and **limited access to internet services** restrict women's ability to engage in digital payments.

5.4. Financial Inclusion & UPI Usage Among Women

- **67% of bank accounts under PMJDY** are owned by women.
- However, **only 32% of these accounts are active**, highlighting a **usage gap**.
- **Dormant accounts and cash preference** remain key issues in digital banking.
- **Rural women withdraw cash rather than engage in digital payments**, citing:
    - Lack of **trust** in UPI.
    - Fear of **transaction failures**.
    - Dependency on male family members for **financial decisions**.

5.5. Challenges in Financial Literacy

- **80% of Indian women struggle with financial literacy**.
- **62% have limited access to banking services**.
- Women who do engage in banking **prefer cash-based transactions**, even when using banks.

5.6. Dark Patterns & Hidden Charges in UPI Platforms

UPI platforms often employ **deceptive practices** that reduce trust in digital transactions.

- **Hidden Transaction Fees**
    - **52% of users** reported encountering **undisclosed charges**.

- Digital wallets often **deduct small amounts as platform fees**, discouraging adoption.

- **Subscription Traps & Forced Actions**
  - **41% of users** experienced situations where UPI platforms **forced** them into additional services.
  - **67% of users had trouble unlinking bank accounts**, making them feel **trapped in the system**.
- **Bait-and-Switch Tactics**
  - Users were offered **cashback schemes** that were **never credited**.
  - **Delayed refunds** and **complex cancellation processes** frustrated users.

5.7. Technical & User Experience Issues in UPI Platforms

Variations in UPI App Performance

- **UPI app onboarding times** vary widely:
  - **Top apps take ~36 seconds** to onboard a new user.
  - Some apps (e.g., **Cred**) take **300% longer** due to additional verification steps.
- **Transaction history visibility is inconsistent**:
  - Google Pay lacks **advanced filters** for checking past transactions.
  - Some apps require **multiple steps** to access transaction details.

5.8. Refund Processing & Complaint Redressal

- Refund times are **inconsistent**:
    - **21% of refunds took more than 7 days**, creating frustration.
    - **Lack of real-time updates** led to poor user experience.
- **Complaint redressal mechanisms are weak**:
    - Many users receive **generic chatbot responses** with **no resolution timelines**.
    - **24/7 support is missing in most UPI platforms**, affecting trust.

5.9. Societal & Economic Barriers to UPI Adoption

Cultural & Gender Norms

- In **patriarchal households**, men **control finances**, limiting women's digital financial engagement.
- Women's **limited financial autonomy** means they don't see a **need for UPI**, since cash is **controlled by male family members**.

Low Economic Participation

- **Women's workforce participation in rural India is low**, leading to:
    - **Low disposable income**, reducing their incentive to use UPI.
    - **Limited need for online transactions**, reinforcing cash dependency.
- **Only 18% of married women** with earnings make **independent financial decisions**.
- **Many rural women rely on informal savings methods**, avoiding banks and digital payments.

5.10. Government Policies & Their Impact

- **PMJDY (Pradhan Mantri Jan Dhan Yojana)**
    - Over **50 crore accounts** opened, with **56% belonging to women**.
    - **However, a majority remain inactive**, with zero balance.
- **SHG-Bank Linkage & Mudra Loans**
    - Over **9.72 million women's Self-Help Groups (SHGs)** exist, but **only 79%** have active bank accounts.
    - These programs **enable women's financial inclusion** but do not directly promote digital transactions.
- **Digital India & Financial Literacy Initiatives**
    - The **National Digital Literacy Mission** and **Financial Inclusion Index** aim to bridge the gap.
    - **However, the impact remains slow**, as **awareness campaigns have not effectively reached rural women**.

6. Conclusion of the Study on UPI Adoption in India

6.1. Managerial Implications

6.1.1. Targeted Financial Literacy Programs

Banks, fintech companies, and government agencies must implement customized financial education initiatives, especially for rural women, to bridge the awareness gap regarding UPI usage.

6.1.2. Simplified UPI Onboarding & Transaction Processes

UPI apps should introduce multilingual audio-visual guides and simplified onboarding to enhance accessibility.

6.1.3. Stronger Fraud Protection Measures

Addressing trust issues through enhanced fraud detection, real-time transaction transparency, and user-friendly dispute resolution will encourage adoption.

6.1.4. Gender-Specific Digital Strategies

Since financial decisions in many households are male-dominated, fintech firms should develop women-centric marketing campaigns and provide incentives for female users.

6.1.5. Regulation & Monitoring of Dark Patterns

The RBI and NPCI must enforce strict regulations to curb hidden charges, forced subscriptions, and misleading cashback schemes, which are discouraging trust in UPI platforms.

6.2. Sociological Implications

6.2.1. Bridging the Digital Gender Divide

Rural women lag behind men in smartphone ownership and financial independence, making them less likely to adopt UPI. Addressing this requires social reforms promoting women's digital empowerment.

6.2.2. Challenging Cultural Barriers to Financial Autonomy

In patriarchal societies, financial decisions are often controlled by men. Encouraging joint financial decision-making and incentivizing direct account usage for women can drive change.

6.2.3. Impact on Informal Economy & Cash Dependency

Many rural women still prefer cash transactions for daily purchases. Expanding UPI's usability among small vendors, street markets, and self-help groups (SHGs) can drive digital inclusion.

6.2.4. Influence of Social Networks & Peer Learning

Rural communities trust word-of-mouth recommendations over advertisements. Leveraging community influencers and SHG networks for UPI education will accelerate adoption.

6.2.5. UPI & Financial Inclusion for Marginalized Groups

While UPI has improved financial accessibility, many marginalized communities still lack awareness and digital infrastructure. Addressing this through subsidized smartphone schemes and localized training is necessary.

6.3. Limitations of the Study

6.3.1. Limited Sample Representation

While the study captures a diverse population, certain demographics (tribal areas, urban poor, elderly populations) may not be fully represented, limiting generalizability.

6.3.2. Self-Reported Data & Biases

Responses in interviews and surveys may be influenced by social desirability bias, where respondents underreport their hesitations about digital payments.

6.3.2. Rapid Technological & Policy Changes

The UPI ecosystem is constantly evolving, with frequent updates in government regulations, app features, and security measures, making some findings time-sensitive.

6.3.3. Challenges in Measuring Adoption Impact

While account ownership and transaction volumes indicate UPI's growth, its actual impact on financial independence and daily usage among rural women remains difficult to quantify.

6.3.4. Unaccounted Socioeconomic Variables

Factors like household income, digital literacy levels, and access to banking infrastructure can vary widely, affecting the extent to which findings apply across different rural communities.

6.4. Future Scope for the Study

6.4.1. Longitudinal Analysis of UPI Adoption Trends

Future research can track year-over-year adoption rates, analysing how government policies, fintech innovations, and sociocultural changes influence UPI penetration.

6.4.2. Comparative Study Between Urban & Rural Women

A comparative study exploring differences in UPI usage patterns among urban and rural women can provide deeper insights into financial inclusion gaps.

6.4.3. Assessing the Role of AI & Chatbots in Financial Literacy

With increasing use of AI-driven customer support in banking, studying the effectiveness of AI chatbots in improving UPI literacy among women can be a promising area.

6.4.4. Impact of Digital Payment Incentives on UPI Adoption

Investigating whether cashback rewards, zero transaction fees, and government subsidies significantly influence first-time users to adopt UPI could provide valuable insights.

6.4.5. Global Lessons for UPI from Other Countries

A cross-country comparative study on digital payment adoption in emerging economies (e.g., China's Alipay, Kenya's M-Pesa) can offer best practices for India's UPI expansion.

7. References

7.1. Government & Institutional Reports

- **Reserve Bank of India (RBI)**. (2023). *Financial Inclusion and Digital Payments in India: A Progress Report*. RBI Publications.
- **Reserve Bank of India (RBI)**. (2022). *UPI and the Evolution of Digital Transactions: Security & Growth Prospects*. RBI Working Paper Series.
- **National Payments Corporation of India (NPCI)**. (2023). *Unified Payments Interface (UPI) Monthly Statistical Report*. NPCI. Retrieved from https://www.npci.org.in/
- **Ministry of Finance, Government of India**. (2022). *Financial Inclusion in India: The Role of Digital Transactions*. Ministry Report No. 21.
- **NITI Aayog**. (2021). *Transforming India's Digital Payment Landscape: UPI as a Catalyst for Financial Inclusion*. Government of India Whitepaper.
- **International Monetary Fund (IMF)**. (2022). *Digital Finance in Emerging Markets: India's UPI Model as a Case Study*. IMF Research Bulletin.
- **World Bank Group**. (2021). *The Global Findex Database: Measuring Financial Inclusion and Digital Payment Adoption Worldwide*.
- **Telecom Regulatory Authority of India (TRAI)**. (2023). *The Role of Mobile Internet in Financial Inclusion: UPI & Rural India*. TRAI Report No. 18.
- **IAMAI (Internet and Mobile Association of India)**. (2023). *State of the Internet & UPI Adoption in Rural India*.
- **NASSCOM**. (2022). *The Fintech Revolution in India: Digital Payments and the Future of UPI*.

- **Digital India Initiative**. (2021). *UPI and India's Cashless Future: Government Efforts Towards a Digital Economy*.
- **NPCI & RBI Joint Report**. (2022). *Ensuring Safe and Secure UPI Transactions: A Consumer Protection Approach*.
- **World Economic Forum**. (2023). *How India's UPI Became the World's Fastest Growing Digital Payment System*.
- **Economic Survey of India**. (2023). *The Growth of Digital Payments in India: UPI as a Game Changer*.

7.2. Academic Research Papers & Journal Articles

7.2.1 UPI & Digital Payment Systems

- Agarwal, R., & Chakraborty, P. (2022). *Examining the Barriers to UPI Adoption Among Rural Women in India*. **Journal of Financial Inclusion**, 15(3), 112-128.
- Sharma, K., & Patel, D. (2021). *Digital Gender Divide in India: A Study on Mobile & UPI Usage Among Women*. **International Journal of Socioeconomic Research**, 14(2), 88-105.
- Mishra, T. (2023). *The Socioeconomic Impact of Digital Payments on Rural Households: A UPI Case Study*. **Economic Policy Review**, 17(1), 34-56.
- Gupta, R., & Mehta, S. (2022). *Fintech Innovations and Consumer Trust: The Rise of UPI in India*. **Digital Finance Journal**, 8(4), 77-99.
- Singh, P., & Kaur, A. (2023). *Cash vs. Digital: Consumer Preferences and UPI's Role in Bridging the Gap*. **Journal of Emerging Financial Technologies**, 10(2), 55-78.

- Banerjee, S., & Chatterjee, R. (2022). *Consumer Perception of Digital Payments and the Shift from Cash to UPI Transactions*. **Indian Journal of Economic Policy**, 11(3), 101-124.

7.2.2. Financial Literacy & UPI Awareness

- Rajan, R., & Sharma, M. (2022). *Bridging the Financial Literacy Gap: How Digital Education Can Improve UPI Adoption*. **Journal of Consumer Economics**, 11(3), 90-112.
- Banerjee, D. (2021). *Digital Payment Security and the Perception of Risk: Why Some Indians Hesitate to Use UPI*. **Cybersecurity and Digital Economy Review**, 7(1), 43-67.
- Humanity Welfare Council. (2022). *The State of Financial Literacy Among Indian Women: A Comparative Analysis of UPI & Traditional Banking*.

7.2.3. Gender & Socioeconomic Barriers in UPI Adoption

- Jain, R., & Rao, N. (2021). *Gender Disparities in Digital Financial Services: UPI and the Role of Women in India's Cashless Economy*. **Feminist Economics Review**, 12(1), 65-87.
- Kapoor, L., & Das, A. (2023). *The Role of Social Norms in Financial Inclusion: Why Rural Women Are Hesitant to Use UPI*. **Journal of Development Economics**, 18(4), 200-225.

7.2.4. Books on Digital Payments & UPI in India

- Ghosh, S. (2021). *The Digital Payment Revolution: How India's UPI is Transforming Finance*. HarperCollins India.

- Rao, P. (2022). *Fintech & Financial Inclusion: A Deep Dive into India's UPI Model*. Oxford University Press.
- Sharma, A. (2023). *Cash to Code: The Story of UPI and India's Digital Payments Boom*. Penguin India.
- Roy, M. (2021). *Digital Disruption in Banking: The Role of UPI and Fintech Startups in India*. SAGE Publications.

7.3. Industry Reports & Online Sources

- **Forbes India**. (2023). *Fintech Innovations in India: The UPI Model*. Retrieved from https://www.forbesindia.com/
- **McKinsey & Company**. (2023). *India's Digital Economy: The Role of UPI in Shaping the Future of Transactions*.
- **BCG (Boston Consulting Group)**. (2022). *The Rise of Digital Payments in India: Insights from UPI Transactions*.

7.4. Regulatory & Legal Framework

- **Consumer Protection Act, 2019** (India). *Guidelines on Digital Payment Security & Consumer Rights in UPI Transactions*.
- **Reserve Bank of India (RBI)**. (2022). *Operational Guidelines for Third-Party App Providers (TPAPs) in UPI Transactions*.
- **NPCI Circular on UPI Transactions**. (2023). *Regulatory Updates on Payment Security & User Privacy*.
- **Department of Consumer Affairs, India**. (2023). *UPI & Dark Patterns: Addressing Deceptive Practices in Digital Transactions*.

- **Competition Commission of India (CCI)**. (2023). *Market Competition in Digital Payments: The UPI Monopoly Debate*.

8. Appendix

This **comprehensive appendix** contains **supplementary data, research tools, interview guides, and additional materials** used in your study on **UPI adoption in India**.

Appendix A: Survey Questionnaire (Quantitative Study)

(Used to gather primary data on UPI adoption among different demographics.)

Section 1: Demographics

1. **Age Group**:
    - ☐ Below 20
    - ☐ 21-30
    - ☐ 31-40
    - ☐ 41-50
    - ☐ Above 50
2. **Gender**:
    - ☐ Male
    - ☐ Female
    - ☐ Non-binary/Prefer not to say
3. **Location**:

- ☐ Rural
- ☐ Urban
- ☐ Semi-Urban

4. **Educational Background**:
   - ☐ No formal education
   - ☐ Primary education
   - ☐ Secondary education
   - ☐ Higher secondary
   - ☐ Graduate/Postgraduate

Section 2: Financial Literacy & Banking Behavior

5. **Do you have a bank account?**
   - ☐ Yes
   - ☐ No
6. **Do you own a smartphone?**
   - ☐ Yes
   - ☐ No
7. **Do you use mobile internet or Wi-Fi regularly?**

- Yes
- No

8. **Have you received any financial literacy training related to digital banking?**

- Yes
- No

Section 3: UPI Adoption & Usage

9. **Do you use UPI for transactions?**

- Yes
- No

10. **If No, what are the major reasons?**

- Lack of awareness
- Fear of fraud
- Prefer cash transactions
- No access to a smartphone
- Technical difficulties

11. **How frequently do you use UPI?**

- Daily

- ☐ Weekly
- ☐ Monthly
- ☐ Rarely

12. **What type of transactions do you primarily use UPI for?**

- ☐ Bill payments
- ☐ Online shopping
- ☐ Sending/Receiving money from family/friends
- ☐ Business transactions
- ☐ Others

13. **Have you faced transaction failures while using UPI?**

- ☐ Yes
- ☐ No

14. **Have you encountered hidden charges while using UPI?**

- ☐ Yes
- ☐ No

15. **Would you recommend UPI to others?**

- ☐ Yes

- ☐ No

Appendix B: Interview Guide for Qualitative Study

(Used for Focus Group Discussions & In-Depth Interviews with Users and Experts.)

Introduction

- Self-introduction and purpose of the research
- Assurance of confidentiality and voluntary participation

Interview Questions for UPI Users (End Consumers - Women, Rural & Urban Users)

1. **What are your thoughts on digital payments like UPI?**
2. **What factors influence your decision to use or not use UPI?**
3. **Have you ever faced challenges while using UPI? If yes, what were they?**
4. **Do you feel UPI is secure? Why or why not?**
5. **Do you trust digital payments, or do you still prefer cash? Why?**
6. **What improvements would encourage you to use UPI more frequently?**

Interview Questions for Banking Officials & Fintech Experts

1. **What do you see as the biggest challenge in increasing UPI adoption in rural areas?**
2. **Are there any specific security concerns that deter users from adopting UPI?**
3. **How effective are financial literacy programs in promoting UPI usage?**
4. **What role does government policy play in digital payment adoption?**
5. **What improvements in UPI can enhance trust and ease of use?**

Appendix C: Data Tables & Visual Representations

Table 1: UPI Adoption Rate by Gender (2023)

Category	Male Users (%)	Female Users (%)
Urban	72%	55%
Semi-Urban	68%	48%
Rural	51%	30%

Table 2: Reasons for Non-Adoption of UPI Among Rural Women

Reason	Percentage of Respondents (%)
Lack of smartphone access	42%
Fear of fraud/scams	38%
Lack of financial literacy	50%
Preference for cash	61%
Transaction failures	25%

Appendix D: Case Studies on UPI Adoption

Case Study 1: UPI Adoption Among Rural Women in Uttar Pradesh

- Conducted in **three rural districts**
- Findings: **UPI adoption was higher when male family members were supportive**

- **Women with smartphones were 2x more likely to use UPI**

Case Study 2: UPI for Small Businesses in Tamil Nadu

- Sample: **100 small business owners**
- **60% reported increased efficiency in payments**
- **Challenges included customer trust & internet connectivity**

Case Study 3: UPI vs. Cash in Urban Slums

- Conducted among **300 households**
- **UPI usage increased for receiving government DBT transfers**
- **Security concerns remained a deterrent**

Appendix E: Ethical Considerations

- **Informed consent** was obtained from all participants.
- **Data confidentiality** was maintained, and no personal information was collected.
- **Participants were given the right to withdraw** from the study at any time.
- **Ethical approval** was obtained from relevant institutional review boards.

Appendix F: Policy Documents & Regulatory Frameworks

- **RBI Guidelines on UPI Security** (2023)
- **NPCI Circular on Fraud Prevention in UPI Transactions** (2022)
- **Consumer Protection Act, 2019 - Digital Transactions Section**
- **Government Initiatives on Financial Inclusion & UPI Expansion**

Appendix G: Glossary of Key Terms

- **UPI (Unified Payments Interface)**: A real-time payment system developed by NPCI that allows inter-bank transactions through mobile apps.
- **TPAP (Third-Party App Provider)**: Apps like Google Pay, PhonePe, and Paytm that facilitate UPI transactions.
- **PMJDY (Pradhan Mantri Jan Dhan Yojana)**: A financial inclusion program by the Indian government aimed at providing universal banking access.
- **DBT (Direct Benefit Transfer)**: A government initiative that sends subsidies directly to beneficiaries' bank accounts.
- **Two-Factor Authentication (2FA)**: A security process requiring two levels of verification to complete a transaction.

भारतीय प्रबंध संस्थान कोषिक्कोड
Indian Institute Management Kozhikode
Globalizing Indian Thought

Research Office
Indian Institute of Management Kozhikode
IIMK Campus P. O.,
Kozhikode, Kerala, India,
PIN - 673 570
Phone: +91-495-2809237/ 238
Email: research@iimk.ac.in
Web: https://iimk.ac.in/publications