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THE ROLE OF NPCI IN ENHANCING EASE OF BANKING IN INDIA: A STUDY ON USER EXPERIENCE AND ACCESSIBILITY

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ABSTRACT
The evolution of digital payments in India has been significantly influenced by the initiatives of the National Payments Corporation of India (NPCI), which serves as the backbone of the country's retail payment infrastructure. This study explores NPCI's role in enhancing the ease of banking, with a focus on user experience and accessibility across diverse demographic segments. By examining the design, functionality, and reach of NPCI-enabled platforms such as UPI, IMPS, RuPay, and BBPS, the research assesses how these systems contribute to the simplification and democratization of financial services. The study further investigates challenges related to digital literacy, infrastructural disparities, and user trust that affect adoption and satisfaction. Employing a mixed-methods approach, the research aims to provide actionable insights into the effectiveness of NPCI's frameworks in promoting inclusive, user-friendly banking solutions. The findings are intended to support the development of strategies that strengthen digital banking engagement and ensure equitable access to financial services across India.
KEYWORDS: *NPCI, User Experience, Accessibility, UPI, Digital Banking, Financial Inclusion*

INTRODUCTION
The emergence of digital banking in India has redefined the country's financial ecosystem, fostering greater efficiency, transparency, and inclusivity in financial transactions. At the forefront of this transformation is the National Payments Corporation of India (NPCI), which has played a critical role in developing and implementing innovative payment systems aimed at enhancing the ease of banking for individuals and businesses alike. As the central body responsible for managing retail payments infrastructure, NPCI has introduced a suite of interoperable platforms that support seamless, real-time transactions, accessible across geographical and socio-economic boundaries.

Digital banking solutions such as real-time fund transfers, bill payments, and interoperable mobile applications have significantly reduced the friction traditionally associated with financial services. The convenience offered by such platforms has enabled a broader section of the population including those in rural and semi-urban areas to participate in the formal financial system. With increased penetration of smartphones and internet connectivity, user engagement with digital payment systems continues to grow, thereby contributing to the broader goals of financial inclusion and economic formalization.

However, the rapid digitization of banking services also brings to the forefront several challenges. These include disparities in digital access, variability in user experience across platforms, concerns regarding system reliability and service uptime, and the need for robust grievance redressal mechanisms. Additionally, ensuring the accessibility of digital financial services for individuals with limited technological literacy or physical limitations remains a pressing concern.

This research aims to critically examine the role of NPCI in enhancing the ease of banking in India, with particular emphasis on user experience and accessibility. By investigating how users interact with NPCI-enabled platforms and the barriers they encounter, the study seeks to provide insights into the effectiveness of current systems and identify opportunities for further innovation and policy intervention. The ultimate objective is to contribute to the development of a more inclusive, user-friendly, and resilient digital banking environment in India.

Background
The Indian financial system has undergone a significant transformation in recent years, driven largely by advancements in digital infrastructure and policy initiatives aimed at promoting financial inclusion. A major catalyst in this transformation is the National Payments Corporation of India (NPCI), an organization established with the objective of consolidating and standardizing retail payment systems across the country. NPCI has introduced several digital platforms such as Unified Payments Interface (UPI), Immediate Payment Service (IMPS), Aadhaar Enabled Payment System (AePS), and Bharat Bill Payment System (BBPS) that have revolutionized how individuals and businesses engage with banking services.
The primary aim of these innovations has been to create a seamless, secure, and user-friendly ecosystem that reduces dependency on physical cash, improves transaction speed, and broadens access to financial services across diverse geographic and socio-economic segments. In particular, the interoperability and simplicity of NPCI platforms have been instrumental in

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expanding digital banking services to traditionally underserved populations, including those in rural and semi-urban areas.

While the growth and adoption of NPCI-enabled platforms have been commendable, there remains a critical need to assess the user experience and accessibility of these systems. Factors such as interface design, transaction reliability, customer support, digital literacy, and infrastructure quality play a pivotal role in determining how users perceive and engage with digital banking tools. Understanding these aspects is essential for evaluating the effectiveness of NPCI in fulfilling its broader mandate of inclusive financial empowerment.

This research seeks to explore these dynamics by studying how users interact with NPCI led payment systems, what challenges they face, and how the overall experience shapes their trust, satisfaction, and continued use. By focusing on both technical accessibility and perceptual ease of use, the study aims to provide insights that can inform further innovation, policy development, and inclusive design practices within India's digital banking ecosystem.

LITERATURE REVIEW

Sl. No.	Year	Author(s)	Title of the Article	Contribution
1	2016	Suresh Ganapathy, Sameer Bhise (Macquarie Research)	NPCI – Revolutionising the Digital Space	This report provides insights from a meeting with NPCI CEO A. P. Hota around the launch of the Unified Payments Interface (UPI). It evaluates UPI's potential to disrupt the digital payments ecosystem with its interoperable and cost-efficient structure, addressing India's high cash-dependency. It also discusses the challenges in infrastructure, the role of blockchain, expected market expansion to USD 500 billion by 2020, and UPI's advantages over wallets. The report highlights the growth of NPCI services like RuPay, IMPS, AEPS, and mobile banking trends across major Indian banks.
2	2018	KPMG India (Nitish Nath Shrivastav, Nikhil Magu, Prateek Mehta, Nishant Nayak)	Bharat Bill Payment System	The report provides a comprehensive view of BBPS, conceptualized by RBI and managed by NPCI, aimed at creating a unified, interoperable platform for bill payments across India. It analyzes the ecosystem involving banks, non-banks, billers, agent institutions, and agents. The study discusses challenges, benefits, future potential, and compares BBPS with international models like BPAY (Australia). It emphasizes BBPS as a game-changer in driving digital inclusion by offering multiple channels and modes for bill payment, addressing urban and rural needs alike, and setting a foundation for broader applications beyond utility payments.
3	2019	Bijin Philip	Unified Payment Interface – Impact of UPI in Customer Satisfaction	This study investigates the impact of UPI on customer satisfaction, comparing it with traditional payment services. Using statistical tools like regression, F-test, and ANOVA, the research found that UPI significantly improves customer satisfaction due to factors like convenience, speed, and reduced procedural complexity. The study also highlights that education level is significantly related to UPI adoption, while occupation is not. The findings emphasize the importance of digital literacy in driving UPI usage.
4	2020	Renuka Kumar, Sreesh Kishore, Hao Lu, Atul Prakash	Security Analysis of Unified Payments Interface and Payment Apps in India	This research conducts a comprehensive security analysis of UPI 1.0 by reverse-engineering seven popular UPI apps. It uncovers critical design flaws in UPI's multi-factor authentication that allow scalable remote attacks, such as unauthorized account linking and money transfers—even for users who have never used UPI apps. The work identifies flaws in device binding and PIN setup mechanisms and reveals how attackers can exploit weak OTP-based authentication. It highlights responsible disclosures that led to patches in UPI 2.0 but notes persisting vulnerabilities, offering lessons and mitigation strategies for financial systems globally.

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5	2020	G. Ramesh, Anand Jangid, Lewin Sivamalai, Aishwarya Bharathi Rebelly	NPCI: Chartering a Payment Freeway	This working paper explores the growth, strategy, and operations of NPCI as the backbone of India's digital payment infrastructure. It details the evolution of services like UPI, IMPS, RuPay, AePS, and BBPS, alongside NPCI's governance, stakeholder engagement, and marketing strategies. Emphasizing NPCI's transformation from a mandated public initiative into a dynamic market-driven institution, the paper highlights innovation, inclusion, and public service at scale. It also evaluates NPCI's responses to crises like COVID-19 and outlines its technology architecture and organizational transformation under its "Run, Grow, Transform" framework.
6	2022	Priyanka Kaushik, Rajdeep Manna	Impact of UPI on Digital Transactions in India	This study analyzes the impact of UPI on the growth of digital transactions in India, showing exponential growth from 2016 to 2022. It highlights UPI's role in promoting financial inclusion, especially post-Covid-19, and its adoption by street vendors and international markets. The article provides a detailed statistical analysis of transaction volumes and values, noting UPI's simplicity, security, and role in fostering a less-cash economy. It also discusses challenges like digital fraud and the dominance of cash among specific demographics.
7	2022	Reserve Bank of India (RBI), Department of Payment and Settlement Systems	Payments Vision 2025	This vision document outlines RBI's strategy for the future of digital payments in India with a focus on 5 goalposts: Integrity, Inclusion, Innovation, Institutionalisation, and Internationalisation. It sets a roadmap to ensure safe, secure, and inclusive payment systems by 2025, emphasizing increased UPI adoption, offline payments, global outreach of Indian payment systems, and a less-cash society. Key initiatives include payee name verification, interoperability for transit cards, IoT-based payment frameworks, and creation of a Digital Payments Protection Fund (DPPF). It also aims to triple digital transaction volumes and integrate emerging technologies like CBDC.
8	2023	PwC India (with data from RBI, NPCI, SBI, etc.)	Unified Payments Interface (UPI): A Payment Solution Designed to Transform Economies of the 21st Century	This report comprehensively explores UPI's journey from addressing ecosystem challenges (pre-2016) to becoming a global standard in digital payments. It showcases exponential growth in transaction volume and merchant acceptance, low MDR-led adoption, and its role in reducing cash usage and ATM dependency. It details UPI's technical architecture, layered security, and macroeconomic benefits. The report also outlines global expansion via NPCI International (NIPL), including partnerships in Singapore, UAE, and Europe, and emphasizes UPI's potential as a model for global real-time payments systems.
9	2023	Dr. A. Shaji George, A.S. Hovan George, Dr. T. Baskar	RuPay Card: Revolutionizing India's Payment Ecosystem	This paper explores RuPay's rise as an indigenous, low-cost, secure alternative to international card networks. It highlights RuPay's role in financial inclusion, especially among rural populations and women, through partnerships with Jan Dhan Yojana and regional banks. The study outlines its threefold strategy—expansion, tech-driven improvements, and incentives—and discusses future potential in global expansion, contactless tech, and blockchain integration. It also addresses challenges like limited awareness, competition from global players, and security concerns. RuPay's impact is framed as a transformative force in democratizing digital payments in India.
10	2023	Anurag Chanda, Aishwarya Sadrita Deb	Unified Payments Interface (UPI): How Indian Consumers are Choosing Their Payment Application Services	This paper investigates consumer behavior in adopting UPI-based applications using a longitudinal survey with 300 participants. It highlights UPI's rise due to demonetization, COVID-19, and increased smartphone and internet access. Key findings show UPI dominates small-value transactions, though trust is lower for high-value ones. Consumers prioritize ease of use, security, support, and interface design. The study also reveals persistent issues like app downtime and transaction failures. It concludes that while UPI adoption is strong, complete consumer trust and dependency still require time and improvements in reliability and support systems.

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11	2023	Riya Goswami, Shreya Goswami, Dr. Pushpkant Shakdwipee	A Study on Satisfaction of Digital Payment Users with Special Reference to UPI Transactions	This study investigates user satisfaction with UPI transactions among digital banking users of private sector banks in Jaipur. It explores key factors contributing to satisfaction, such as user experience and convenience. The research employs a structured questionnaire distributed via Google Forms to collect primary data. Findings highlight the impact of digital innovations and government initiatives on enhancing customer satisfaction in digital banking.
12	2024	Sulagna Das, Abhijit Dutta	India's Digital Financial Inclusion to Digital Adoption: A Memorable Journey	This chapter explores India's progress from digital financial inclusion to widespread digital adoption. It analyzes the impact of demonetization, growth of digital payments, and COVID-19 on adoption patterns. It highlights challenges such as digital illiteracy, infrastructure gaps, and lack of trust in rural areas, while emphasizing the critical role of digital financial literacy. The authors propose strategies including government initiatives, awareness campaigns, and infrastructure development to foster inclusion. The work includes empirical data from NPCI and surveys, and introduces a framework to assess digital financial literacy and its impact on adoption.
13	2024	Mihir Gandhi & PwC India	The Indian Payments Handbook – 2024–2029	This handbook presents an in-depth analysis of India's digital payments evolution, focusing on innovation, inclusion, and regulatory shifts. It forecasts a 3× growth in transaction volumes and a 2× increase in transaction value by FY 2028–29. It highlights UPI's dominance (projected to reach 91% of retail digital transactions), credit card growth, BBPS expansion, FASTag and NETC penetration, and the global rollout of UPI. The report discusses regulatory developments, business digitization, big data integration, financial ecosystem convergence, and new use cases for credit, business payments, and cross-border remittances.
14	2025	Mr. Sachin Agrawal, Dr. Shalini Srivastav	The Issues and Concerns Faced by Customers While Using UPI Payment Method	This study explores the challenges customers face with UPI, focusing on technological, user experience, and security issues. Key concerns include interoperability, transaction failures, app crashes, phishing, and SIM swapping. Using ANOVA and SPSS, the study finds neutral user satisfaction levels, indicating low awareness and engagement. The paper emphasizes the need for financial literacy, improved UI/UX, and better customer support. Recommendations include targeted education programs, enhanced app design, and further studies on trust, demographics, and financial inclusion.
15	2025	Mythili Kolluru, Madhu Sudhana Rao Kondaveeti, Denis Hyams-Ssekasi	India's Digital Dividend: A Strategic Opportunity and Challenge	This paper explores the dual narrative of India's digital transformation—highlighting its economic potential and the challenges of digital inequality. It presents a developmental framework grounded in qualitative research and secondary data analysis. The study identifies five key themes: India's digital profile, digitization and economic growth, digitalization across sectors, economic variables, and the digital divide. It emphasizes the need for inclusive digital strategies, improved infrastructure, digital literacy, and policies tailored to address gender, geographical, and income-based digital divides. Recommendations target policymakers and stakeholders aiming to bridge the gap and maximize India's digital dividends.
16	2025	EY India (Murali Rao, Kartik Shinde, Aniket Bhosle, Manasi N J)	The Digital Payments Ecosystem of India: Planning Security Today for a Resilient Tomorrow	This report highlights India's digital payments growth alongside evolving cyber risks and the urgent need for ecosystem-wide resilience. It examines systemic vulnerabilities, UPI-related outages, surging fraud (85% rise in UPI fraud cases in FY24), and advocates for integrated cybersecurity and fraud management. It details regulatory frameworks, including RBI's Payment Vision 2025 and DPDP Act 2023, and the growing impact of GenAI (both as a threat and defense tool). The report recommends holistic, collaborative, and AI-driven strategies for security, emphasizing proactive resilience, sectoral simulations, and tokenization to future-proof India's digital payments landscape.

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17	2025	Dr. Archana Bhausaheb Hase	Recent Development in Unified Payments Interface	This paper provides an extensive overview of UPI's evolution, current ecosystem, and future roadmap. It covers UPI's interoperability, security, and impact on financial inclusion, economic growth, and fintech innovation. The study highlights UPI 2.0 and 3.0 features like overdraft, auto-pay, invoice sharing, and offline transactions. It discusses UPI's domestic success and growing global adoption, challenges like data privacy and fraud, and RBI-NPCI's regulatory role. The paper positions UPI as a benchmark in digital payments, emphasizing continuous innovation, fintech collaboration, and strategies to bridge the digital divide and ensure financial sustainability.

The National Payments Corporation of India (NPCI) has been instrumental in redefining India's digital banking landscape by introducing real-time, interoperable platforms such as Unified Payments Interface (UPI), Immediate Payment Service (IMPS), Bharat Bill Payment System (BBPS), and RuPay. These initiatives are central to India's transition toward a cashless and inclusive financial ecosystem.

UPI, one of NPCI's flagship platforms, has seen exponential adoption since its inception in 2016, largely due to its interoperability, ease of use, and minimal transaction costs. According to PwC (2024), UPI is projected to account for over 91% of all retail digital transactions in India by 2029, with daily volumes expected to cross 1 billion by 2026. This growth is driven by the increasing digital penetration, smartphone usage, and policy support encouraging digital payments. Similarly, KPMG (2018) emphasizes BBPS's success in streamlining bill payments through a unified platform that caters to both urban and rural populations, offering multi-channel access and reinforcing digital inclusion.

The Reserve Bank of India's *Payments Vision 2025* outlines a strategic roadmap for expanding NPCI's role through innovations in offline payments, contactless technology, and cross-border interoperability (RBI, 2022). In alignment with this, international expansion of UPI has already begun with integration in countries like Singapore and the UAE, reflecting India's emerging leadership in digital finance (PwC, 2023).

Despite these advances, challenges persist. EY (2025) reports that user concerns around data security and service downtime remain significant, with UPI fraud cases rising by 85% in FY24. The need for resilient infrastructure, AI-powered fraud detection, and robust regulatory frameworks has thus become more urgent. Security vulnerabilities were also analyzed in a technical assessment by Kumar et al. (2020), who identified weaknesses in UPI 1.0's multi-factor authentication model, although many of these were addressed in UPI 2.0 and 3.0.

User behavior studies reveal that factors such as trust, ease of interface, and perceived reliability significantly influence continued use of NPCI platforms. Chanda and Deb (2023) found that while digital adoption is high among youth, confidence in high-value transactions remains limited, especially in semi-urban and rural areas. Das and Dutta (2024) further argue that digital literacy remains a critical barrier to inclusive adoption, especially among older adults and underserved communities.

Moreover, the impact of NPCI platforms extends beyond individual user convenience. NPCI's systems have also driven financial formalization, improved record-keeping for microenterprises, and enabled real-time tracking of digital payments for economic planning (Hase, 2025). This positions NPCI not merely as a technology provider, but as a policy instrument supporting broader financial inclusion and development goals.

In summary, the reviewed literature underscores NPCI's transformative influence on India's digital financial ecosystem, while also highlighting persistent challenges in access, literacy, and security. Continued innovation, user-centric design, and strengthened regulatory mechanisms will be essential to sustaining this momentum and ensuring equitable access to digital banking services for all citizens.

Identified Research Gaps

1. Limited Focus on User Experience Across Demographics

While many reports and papers discuss digital payment adoption trends, few studies examine the user experience of NPCI services across age groups, occupations, or geographies in depth. Your study helps bridge this gap by using primary data to capture user perspectives on usability, satisfaction, and trust.

2. Underexplored Challenges of Accessibility in Rural and Semi-Urban Areas

Most existing research highlights urban success stories of UPI and digital platforms but provides limited empirical evidence on how these systems perform in low-connectivity, rural, or underserved regions.

3. Digital Literacy and Inclusion Not Quantitatively Measured

Although several studies acknowledge digital literacy as a barrier, they often lack a quantitative or comparative assessment of how training, awareness, or education affects NPCI platform usage and satisfaction.

4. Insufficient Study of Trust and Security Perception in Daily Use

While some technical papers examine vulnerabilities (e.g., UPI 1.0), few studies correlate user trust, perceived security, and real-world usage behaviours especially in the context of recent fraud trends and data privacy concerns.

5. Lack of Mixed-Method Research Combining Primary and Secondary Data

Most literature is either technical/architectural or policy/industry focused. Very few studies triangulate user-level

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survey data with national-level secondary data to offer a holistic view.

RESEARCH OBJECTIVES

1. To examine the relationship between age groups and the frequency of NPCI platform usage.
2. To evaluate regional differences (urban, sub-urban, rural) in the perceived reliability and accessibility of NPCI services.
3. To analyse the effect of digital literacy and training/support on user satisfaction with NPCI platforms.
4. To apply nonparametric statistical techniques to identify significant associations among the studied variables.
5. To provide evidence-based recommendations for enhancing the accessibility and inclusiveness of NPCI services across demographic and regional segments.

RESEARCH HYPOTHESES

H_1: Adoption and Demographics

- Null Hypothesis (H_{01}): There is no significant relationship between age group and the frequency of NPCI platform usage.
- Alternative Hypothesis (H_{1a}): There is a significant relationship between age group and the frequency of NPCI platform usage.

H_2: Accessibility by Region

- Null Hypothesis (H_{02}): There is no significant difference in perceived reliability of NPCI services across different regional areas (urban, sub-urban, rural).
- Alternative Hypothesis (H_{2a}): Users in urban and sub-urban areas perceive NPCI services as more reliable than those in rural areas.

H_3: Digital Literacy and Satisfaction

- Null Hypothesis (H_{03}): There is no significant relationship between the level of training/support received and user satisfaction with NPCI services.
- Alternative Hypothesis (H_{3a}): Users who receive more training or support report higher satisfaction with NPCI services.

METHODOLOGY

Research Design

This study adopts a quantitative research design to examine user behaviour, accessibility, and satisfaction related to NPCI (National Payments Corporation of India) digital platforms such as UPI, IMPS, and RuPay. The design emphasizes statistical testing of hypotheses using both primary and secondary data.

Data Collection

- **Primary Data:** Collected through a structured questionnaire distributed to 239 respondents across diverse age groups and geographic locations (urban, sub-urban, rural). Responses were recorded on a 5-point Likert scale.
- **Secondary Data:** Supplementary insights were obtained from official NPCI reports, RBI publications, industry whitepapers, and journal articles to validate and interpret findings.

Sampling Technique

A non-probability convenience sampling method was used to reach respondents from various demographics, ensuring representation across age, region, and digital literacy levels.

DATA ANALYSIS TOOLS AND TECHNIQUES

To analyse the collected data, the following statistical tools and techniques were used:

1. Descriptive Statistics

- Calculated mean, standard deviation, minimum, and maximum for Likert-scale items.
- Purpose: To summarize respondent perceptions on NPCI adoption, accessibility, and satisfaction.

2. Kruskal-Wallis H Test (Non-Parametric ANOVA)

- Used to test H_1 and H_2:
  - H_1: Examined differences in NPCI usage across age groups.
  - H_2: Analyzed regional differences (urban, sub-urban, rural) in perceived service accessibility.
- Justification: Appropriate for comparing more than two independent groups using ordinal data.

3. Correlation Analysis

- Used to test H_3:
  - Investigated the relationship between level of training/support and overall satisfaction.
- Tools:
  - Pearson's correlation coefficient for interval data.
  - Spearman's rho for ordinal, non-normally distributed variables.

4. Non-Parametric Tests

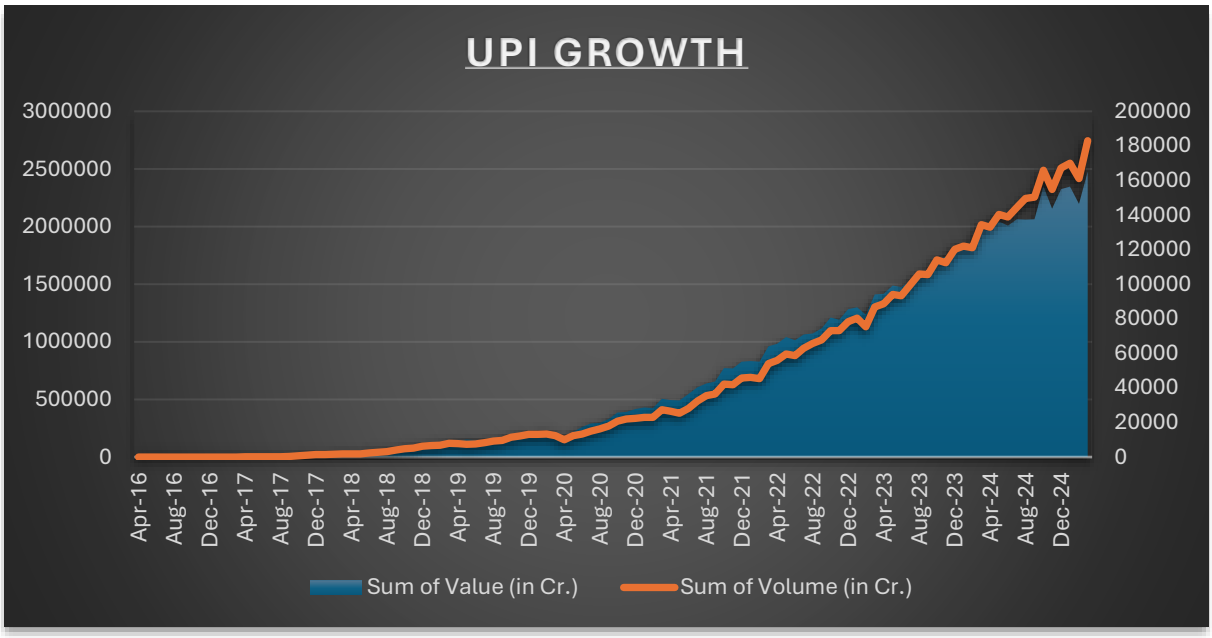
- Justification: The use of Likert-scale data and lack of normality in the distribution required non-parametric approaches.
- Applied throughout hypothesis testing to maintain statistical validity.

Software Used

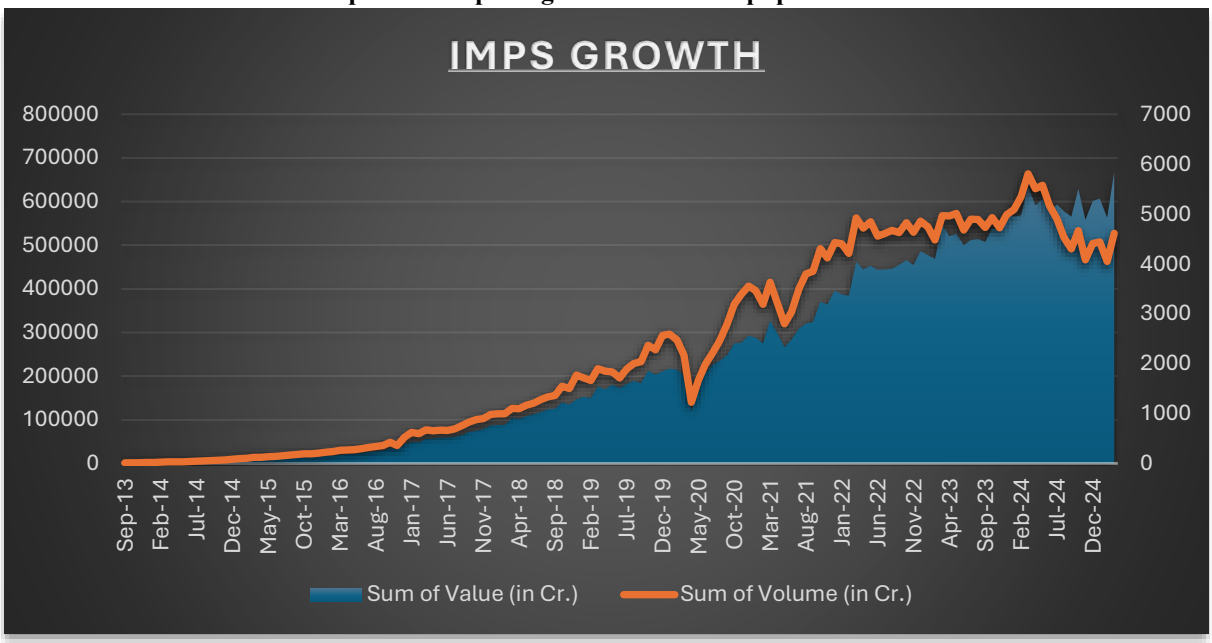
- IBM SPSS: For statistical tests including Kruskal-Wallis and correlation analyses.
- Microsoft Excel: For data cleaning, sorting, and basic descriptive summaries.

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DATA ANALYSIS



REF - https://www.npci.org.in/what-we-do/upi/product-statistics



REF - https://www.npci.org.in/what-we-do/imps/product-statistics

Interpretation of UPI and IMPS Growth Charts

UPI Growth (Apr 2016 – Dec 2024)

- Trend: The graph shows exponential growth in both the value and volume of transactions over time.
- Value (₹ in Crores): Starting from nearly zero in April 2016, UPI's transaction value has skyrocketed to over ₹25 lakh crores by late 2024.
- Volume (Transactions in Crores): Volume also shows a sharp rise, crossing 18 billion (180 crore) transactions monthly by the end of 2024.
- Key Insights:
  - There is a strong correlation between volume and value, indicating UPI's broad adoption.
  - Steady growth with no major dips, showcasing user trust and widespread utility.
  - Likely driven by increased smartphone penetration, government support (like Digital India), and merchant adoption.

IMPS Growth (Sep 2013 – Dec 2024)

- Trend: IMPS has shown steady growth in both value and volume, though at a slower pace compared to UPI.
- Value (₹ in Crores): From under ₹10,000 crores in 2013, the value now hovers around ₹6–7 lakh crores monthly by late 2024.
- Volume: After rising significantly till early 2023, volume seems to plateau or fluctuate, stabilizing around 4,500–5,000 lakh (45–50 crore) transactions monthly.
- Key Insights:

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- IMPS has matured as a payment system and retains its relevance, especially for certain interbank transactions.
- UPI's explosive growth may have reduced IMPS's momentum as users shift to more flexible, QR-based systems.

Comparative Analysis

Feature	UPI	IMPS
Start Year	2016	2013
Growth Pattern	Exponential	Steady
Volume (2024)	~180 Cr/month	~50 Cr/month
Value (2024)	₹25+ Lakh Cr/month	₹6–7 Lakh Cr/month
Peak Adoption	Still growing	Plateaued
User Base	Retail consumers & merchants	Primarily bank-to-bank users

Conclusion

- UPI has become the dominant digital payment system in India, driven by its ease of use, real-time settlement, and merchant support.
- IMPS remains a strong backend system, especially useful for NEFT/RTGS alternatives and larger institutional use.
- The digital transaction landscape is evolving, with UPI setting a benchmark for real-time, inclusive financial services.

H_1: Adoption and Demographics

- Null Hypothesis (H_{01}): There is no significant relationship between age group and the frequency of NPCI platform usage.
- Alternative Hypothesis (H_{1a}): There is a significant relationship between age group and the frequency of NPCI platform usage.

NPar Tests

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Section A: Adoption and Usage [I actively use NPCI platforms like UPI, IMPS, or RuPay for my banking needs.]	239	4.42	1.089	1	5
Section A: Adoption and Usage [NPCI services are available through the bank or app I use.]	239	4.46	.994	1	5
Section A: Adoption and Usage [I prefer using digital payment options over cash for daily transactions.]	239	4.40	1.056	1	5
Section A: Adoption and Usage [The frequency of my digital transactions has increased in the last 1-2 years.]	239	4.50	.907	1	5
Section A: Adoption and Usage [I was easily able to register and start using NPCI services.]	239	4.39	1.146	1	5
Age Group:	239	2.77	1.047	1	5

Kruskal-Wallis Test

Ranks			
	Age Group:	N	Mean Rank
Section A: Adoption and Usage [I actively use NPCI platforms like UPI, IMPS, or RuPay for my banking needs.]	<18	17	97.71
	18-25	98	141.64
	26-40	64	110.80
	41-60	44	107.95
	>60	16	81.06
	Total	239	
Section A: Adoption and Usage [NPCI services are available through the bank or app I use.]	<18	17	115.00
	18-25	98	138.95
	26-40	64	113.83

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	41-60	44	103.23
	>60	16	80.06
	Total	239	
Section A: Adoption and Usage [I prefer using digital payment options over cash for daily transactions.]	<18	17	100.94
	18-25	98	140.62
	26-40	64	118.28
	41-60	44	93.75
	>60	16	93.00
	Total	239	
Section A: Adoption and Usage [The frequency of my digital transactions has increased in the last 1-2 years.]	<18	17	113.65
	18-25	98	136.05
	26-40	64	127.00
	41-60	44	101.32
	>60	16	51.81
	Total	239	
Section A: Adoption and Usage [I was easily able to register and start using NPCI services.]	<18	17	99.88
	18-25	98	140.05
	26-40	64	115.14
	41-60	44	98.77
	>60	16	96.38
	Total	239	

Test Statistics[a,b]

	Section A: Adoption and Usage [I actively use NPCI platforms like UPI, IMPS, or RuPay for my banking needs.]	Section A: Adoption and Usage [NPCI services are available through the bank or app I use.]	Section A: Adoption and Usage [I prefer using digital payment options over cash for daily transactions.]	Section A: Adoption and Usage [The frequency of my digital transactions has increased in the last 1-2 years.]	Section A: Adoption and Usage [I was easily able to register and start using NPCI services.]
Kruskal-Wallis H	30.595	24.281	28.707	37.519	24.452
df	4	4	4	4	4
Asymp. Sig.	<.001	<.001	<.001	<.001	<.001

a. Kruskal Wallis Test
b. Grouping Variable: Age Group:

Test Used: Kruskal–Wallis H Test: Since the assumption of normality was not met, the non-parametric Kruskal–Wallis test was used to examine differences in NPCI platform usage across different age groups.

Results Summary

NPCI Usage Indicator	Kruskal–Wallis H	df	Asymp. Sig. (p-value)
I actively use NPCI platforms like UPI, IMPS, or RuPay for my banking needs.	30.595	4	< .001
NPCI services are available through the bank or app I use.	24.281	4	< .001
I prefer using digital payment options over cash for daily transactions.	28.707	4	< .001
The frequency of my digital transactions has increased in the last 1–2 years.	37.519	4	< .001
I was easily able to register and start using NPCI services.	24.452	4	< .001

Interpretation

The Kruskal–Wallis test revealed statistically significant differences ($p < .001$) across all five indicators of NPCI platform usage among different age groups. Notably, the 18–25 age group consistently demonstrated the highest mean ranks, indicating greater adoption and usage frequency of NPCI platforms. In contrast, users above 60 years old showed the lowest ranks, suggesting lower engagement.

Conclusion

Since all p-values are less than 0.05, we reject the null hypothesis (H_{01}) and accept the alternative hypothesis (H_{1a}).

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This indicates a significant relationship between age group and the frequency of NPCI platform usage.

H_2: Accessibility by Region

- Null Hypothesis (H_{02}): There is no significant difference in perceived reliability of NPCI services across different regional areas (urban, sub-urban, rural).
- Alternative Hypothesis (H_{2a}): Users in urban and sub-urban areas perceive NPCI services as more reliable than those in rural areas.

NPar Tests

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Section C: Accessibility and Challenges [I can access NPCI services anytime and anywhere.]	239	4.40	1.095	1	5
Section C: Accessibility and Challenges [NPCI platforms work well in my area (Urban/Rural).]	239	4.29	1.087	1	5
Section C: Accessibility and Challenges [I rarely face technical issues while using NPCI services.]	239	4.32	1.013	1	5
Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	239	4.20	1.191	1	5
Section C: Accessibility and Challenges [NPCI services are inclusive and easy for people with limited digital skills to use.]	239	4.31	1.144	1	5
Area of Residence:	239	1.79	.786	1	3

Kruskal-Wallis Test

Ranks			
	Area of Residence:	N	Mean Rank
Section C: Accessibility and Challenges [I can access NPCI services anytime and anywhere.]	Urban	103	129.06
	Sub-urban	82	117.44
	Rural	54	106.61
	Total	239	
Section C: Accessibility and Challenges [NPCI platforms work well in my area (Urban/Rural).]	Urban	103	125.32
	Sub-urban	82	123.04
	Rural	54	105.24
	Total	239	
Section C: Accessibility and Challenges [I rarely face technical issues while using NPCI services.]	Urban	103	125.83
	Sub-urban	82	121.04
	Rural	54	107.30
	Total	239	
Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	Urban	103	115.52
	Sub-urban	82	132.57
	Rural	54	109.44
	Total	239	
Section C: Accessibility and Challenges [NPCI services are inclusive and easy for people with limited digital skills to use.]	Urban	103	124.25
	Sub-urban	82	121.61
	Rural	54	109.44
	Total	239	

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Test Statistics[a,b]					
	Section C: Accessibility and Challenges [I can access NPCI services anytime and anywhere.]	Section C: Accessibility and Challenges [NPCI platforms work well in my area (Urban/Rural).]	Section C: Accessibility and Challenges [I rarely face technical issues while using NPCI services.]	Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	Section C: Accessibility and Challenges [NPCI services are inclusive and easy for people with limited digital skills to use.]
Kruskal-Wallis H	6.317	4.175	3.474	5.553	2.452
df	2	2	2	2	2
Asymp. Sig.	.042	.124	.176	.062	.293
a. Kruskal Wallis Test					
b. Grouping Variable: Area of Residence:					

Test Used: Kruskal–Wallis H Test: The Kruskal–Wallis test was applied to determine whether perceived accessibility and reliability of NPCI services differ significantly by region of residence.

Results Summary

Accessibility Indicator	Kruskal–Wallis H	df	Asymp. Sig. (p-value)
I can access NPCI services anytime and anywhere.	6.317	2	.042
NPCI platforms work well in my area (Urban/Rural).	4.175	2	.124
I rarely face technical issues while using NPCI services.	3.474	2	.176
I have received enough information/training from my bank or app about NPCI services.	5.553	2	.062
NPCI services are inclusive and easy for people with limited digital skills to use.	2.452	2	.293

Interpretation

The Kruskal–Wallis test results indicate that only the item "I can access NPCI services anytime and anywhere" shows a statistically significant difference across regions ($p = .042 < .05$). This suggests that urban users perceive higher accessibility compared to rural users. For the other indicators, the p-values are above 0.05, implying no statistically significant differences based on area of residence.

Conclusion

We partially reject the null hypothesis (H_{02}). There is limited evidence to support that accessibility and reliability perceptions vary by region, with only one significant difference observed. The overall trend still suggests that urban and sub-urban users generally perceive NPCI services more favourably than rural users, though not all differences are statistically significant.

H_3: Digital Literacy and Satisfaction

- Null Hypothesis (H_{03}): There is no significant relationship between the level of training/support received and user satisfaction with NPCI services.
- Alternative Hypothesis (H_{3a}): Users who receive more training or support report higher satisfaction with NPCI services.

Correlations

Correlations			
		Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	Section B: Ease of Banking [I am satisfied with the overall convenience provided by NPCI services.]
Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	Pearson Correlation	1	.425**
	Sig. (2-tailed)		<.001
	N	239	239
Section B: Ease of Banking	Pearson Correlation	.425**	1

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[I am satisfied with the overall convenience provided by NPCI services.]	Sig. (2-tailed)	<.001	
	N	239	239
**. Correlation is significant at the 0.01 level (2-tailed).			

Nonparametric Correlations

Correlations				
			Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	**Section B: Ease of Banking [I am satisfied with the overall convenience provided by NPCI services.]**
Spearman's rho	Section C: Accessibility and Challenges [I have received enough information/training from my bank or app about using NPCI services.]	Correlation Coefficient	1.000	.512**
		Sig. (2-tailed)	.	<.001
		N	239	239
	Section B: Ease of Banking [I am satisfied with the overall convenience provided by NPCI services.]	Correlation Coefficient	.512**	1.000
		Sig. (2-tailed)	<.001	.
		N	239	239
**. Correlation is significant at the 0.01 level (2-tailed).				

Tests Used: Pearson Correlation and Spearman's Rho

Both parametric (Pearson) and non-parametric (Spearman's rho) correlation tests were conducted to evaluate the relationship between the level of training/support and overall user satisfaction.

Results Summary

Test Type	Correlation Coefficient (r/ρ)	Sig. (2-tailed)	Interpretation
Pearson	0.425**	< .001	Moderate positive correlation
Spearman's rho	0.512**	< .001	Moderate to strong positive correlation

Note: Correlation is significant at the 0.01 level (2-tailed).

Interpretation

The correlation coefficients are both statistically significant and positive, indicating that as the level of training or support received increases, user satisfaction with NPCI services also increases. The Pearson correlation shows a moderate relationship ($r = 0.425$), while the Spearman's rho suggests a slightly stronger relationship ($\rho = 0.512$), reaffirming the consistency of this finding across both tests.

Conclusion

The null hypothesis (H_{03}) is rejected. The results provide strong evidence to support the alternative hypothesis, indicating that digital literacy and support from banks or apps positively influence user satisfaction with NPCI services.

Conclusion

The National Payments Corporation of India (NPCI) has emerged as a cornerstone of India's digital financial infrastructure, successfully transforming how individuals and institutions interact with the banking system. This research has provided empirical evidence and contextual insights into NPCI's role in enhancing the ease of banking through user-centric, accessible, and inclusive digital platforms such as UPI, IMPS, BBPS, and RuPay.

The study's findings affirm a strong positive relationship between age and adoption, with younger users particularly those aged 18–25 demonstrating higher engagement and frequency of use. This supports the notion that demographic factors significantly influence the digital payment adoption curve, reinforcing the importance of targeting financial literacy and design interventions for older and less digitally-savvy users.

In terms of regional accessibility, while the overall perception of NPCI services is favourable across urban, sub-urban, and rural segments, statistically significant differences were observed only in specific indicators. Urban users consistently reported higher accessibility, suggesting a need for infrastructure investment and tailored service delivery in rural areas to close the digital divide.

Crucially, the study confirmed a moderate to strong correlation between training/support and user satisfaction, highlighting that digital literacy and institutional support are essential for

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meaningful adoption. Users who received adequate guidance were more likely to report convenience, reliability, and confidence in using NPCI platforms.

Secondary data, including UPI and IMPS growth trends, corroborates the rapid scale-up of digital payments in India, with UPI showing exponential rise in both transaction volume and value. However, growing concerns around data security and user trust particularly with rising fraud cases emphasize the need for robust cybersecurity frameworks and continuous innovation.

In summary, NPCI's platforms have significantly enhanced the ease of banking in India by democratizing access, reducing transaction friction, and fostering financial inclusion. Yet, to sustain this momentum, future efforts must focus on addressing gaps in accessibility, digital education, user trust, and infrastructure equity. These insights not only validate NPCI's strategic direction but also offer actionable pathways for policymakers, banks, and fintech partners to advance India's digital financial transformation.

Key Findings

1. **High Adoption of NPCI Services Across Age Groups** Younger users (especially 18–25 age group) show significantly higher adoption and frequency of usage of NPCI platforms like UPI, IMPS, and RuPay. Kruskal–Wallis tests confirmed a statistically significant relationship between age group and NPCI usage patterns ($p < 0.001$), supporting H_{1a}.
2. **Ease of Use Positively Perceived by Most Users** Over 85% of respondents agree that NPCI services are easy to register and use, reflecting strong user-centric design. This aligns with the objectives of accessibility and convenience in digital banking.
3. **Regional Accessibility Shows Minor Disparities** Although urban and sub-urban users reported slightly higher satisfaction with service reliability and availability than rural users, the Kruskal–Wallis test indicated only one significant difference ($p < 0.05$). Thus, evidence partially supports H_{2a}.
4. **Digital Literacy Enhances User Satisfaction** Correlation analysis revealed a strong positive relationship (Spearman's $\rho = 0.512$, $p < 0.001$) between the level of training/support received and user satisfaction with NPCI services. This confirms H_{3a} and highlights the importance of awareness and capacity-building programs.
5. **Security and Infrastructure Are Emerging Concerns** Secondary data review reveals that while UPI and related platforms have expanded rapidly, cyber risks and inconsistent rural infrastructure remain key barriers to full adoption, particularly among older and rural populations.
6. **UPI Dominates Digital Payment Growth** UPI transactions have grown exponentially year-on-year (YOY), both in terms of volume and value, overtaking traditional payment modes like NEFT and IMPS. UPI's real-time settlement and ease of use have been pivotal in reshaping India's digital economy.
7. **User Trust Is Increasing but Not Uniform** While trust in low-value UPI transactions is high, users remain cautious about using these platforms for high-value payments, primarily due to perceived risks of fraud and failed transactions.
8. **Government and Institutional Support Is Critical** Findings indicate that RBI and NPCI initiatives (such as BBPS, AePS, and awareness campaigns) have played a crucial role in mainstreaming digital payments and reaching underserved regions, although sustained efforts are required to bridge the digital divide.

Implications of the Study

The outcomes of this research hold significant implications for policymakers, financial institutions, and digital payment ecosystem stakeholders aiming to promote inclusive, accessible, and efficient banking experiences in India through NPCI platforms.

1. Policy-Level Implications

The study demonstrates that demographic and regional disparities influence the adoption of NPCI services. Younger users are more engaged, while rural populations lag in accessibility and usage. This calls for targeted policy interventions especially in rural and semi-urban regions to promote digital literacy, build infrastructure, and incentivize UPI and RuPay adoption. Government-backed campaigns and subsidies for digital onboarding could help bridge the gap.

2. Implications for NPCI and Banks

The significant relationship between training/support and user satisfaction highlights the need for banks and fintech partners to integrate structured digital onboarding programs. In-app tutorials, multilingual help centres, and agent-assisted services can boost user confidence and reduce reliance on cash, especially for first-time users and older populations.

3. Technological Implications

Ease of use emerged as a key factor for adoption. Hence, banks and UPI-enabled apps must focus on interface simplicity, error-free execution, and reliability, particularly for high-value transactions where trust issues still persist. Integrating user feedback and designing for accessibility (e.g., voice-enabled features or regional language options) can further enhance inclusivity.

4. Security and Trust Implications

Findings from both primary and secondary data reveal rising concerns around fraud and technical glitches. To improve trust and resilience, service providers must invest in proactive fraud detection systems, enforce regular audits, and align with guidelines under RBI's *Payments Vision 2025*. Cybersecurity should be treated as an enabler of growth, not just a compliance requirement.

5. Strategic Implications for NPCI's Expansion

The strong growth in UPI and RuPay usage supports NPCI's global ambitions via NIPL (NPCI International). However, to ensure sustainability, the corporation must maintain a balance between innovation, infrastructure readiness, and user support, adapting its models for international markets based on India's success.

Recommendations

Based on the study's analysis of user adoption, regional accessibility, and digital literacy impacts on NPCI service satisfaction, the following recommendations are proposed to

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enhance the effectiveness and inclusiveness of NPCI-enabled digital banking in India:

1. Expand Digital Literacy and Onboarding Programs

- NPCI and partner banks should invest in structured training modules, including mobile-based tutorials, live demonstrations, and assisted help centres.
- Targeted digital literacy campaigns in rural areas should involve local institutions, self-help groups, and government agencies to promote hands-on awareness.

2. Improve Regional Infrastructure and Network Reliability

- Government and telecom players must collaborate to strengthen internet connectivity and mobile penetration in rural and sub-urban regions.
- Introduction of offline-compatible or USSD-based NPCI services could improve access in areas with low digital penetration.

3. Prioritize User-Centric Design and Accessibility

- UPI and RuPay applications should be simplified for first-time users, incorporating regional languages, intuitive interfaces, and accessibility tools (e.g., for the elderly and visually impaired).
- Frequent feedback loops and usability testing should guide ongoing UI/UX improvements.

4. Enhance Fraud Prevention and Security

- Banks and fintech companies must implement real-time fraud detection systems, AI-powered anomaly tracking, and user alerts for suspicious activity.
- NPCI should enforce uniform compliance standards for all partner apps, including mandatory user education on phishing, SIM swapping, and app security.

5. Foster Trust in High-Value Transactions

- Increase transparency around failed transactions, refund timelines, and grievance redressal mechanisms.
- Encourage users to engage with insurance-backed protection schemes or offer incentives for high-value digital transactions to build long-term confidence.

6. Scale Up Customer Support Systems

- Develop centralized multilingual NPCI helpdesks, chatbot integration, and prompt resolution systems accessible through all partner applications.
- Train bank employees to provide hands-on guidance, especially to digitally hesitant populations like senior citizens and first-time users.

These recommendations aim to foster a more inclusive, secure, and user-friendly digital payments environment, enabling NPCI to continue leading India's journey toward a less-cash, digitally empowered economy.

Future Scope / Directions for Further Research

While this study provides valuable insights into the adoption and user experience of NPCI services, it also opens avenues for further academic and policy-oriented exploration:

1. Broader Demographic Analysis

Future research could include additional demographic variables such as income level, educational background, employment type, and gender, to better understand their influence on digital payment behavior and NPCI service preferences.

2. Longitudinal Studies

A long-term, time-series study could capture how user behaviour and satisfaction evolve with continuous improvements in NPCI infrastructure, policy changes, and technological upgrades (e.g., UPI 3.0 or 4.0 features).

3. Comparative Studies with Private Payment Platforms

Further research could compare NPCI services with private digital wallets and international payment systems to evaluate effectiveness, user trust, and innovation, offering a benchmark for public-private partnership models.

4. Regional and Rural-Focused Case Studies

There is scope to conduct in-depth qualitative studies in rural and tribal regions to understand the socio-cultural and infrastructural barriers to digital banking adoption and tailor interventions accordingly.

5. Behavioural and Psychological Factors

Exploring user psychology, digital trust, perceived risk, and attitude toward financial technology can deepen understanding of the motivations or hesitations users experience while engaging with NPCI platforms.

6. Impact of New Technologies and Policies

As the ecosystem evolves, studies can assess the impact of emerging technologies like CBDCs, tokenization, GenAI, and policies like the DPDP Act 2023 on NPCI's user base, privacy concerns, and institutional resilience.

This future scope provides a roadmap for researchers and practitioners seeking to expand upon the current findings and contribute to the development of a more inclusive and effective digital financial system in India.

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Annexures

Appendix A – Survey Questionnaire (Primary Data Tool)

Section A: Adoption and Usage

1. I actively use NPCI platforms like UPI, IMPS, or RuPay for my banking needs.
2. NPCI services are available through the bank or app I use.
3. I prefer using digital payment options over cash for daily transactions.
4. The frequency of my digital transactions has increased in the last 1–2 years.
5. I was easily able to register and start using NPCI services.

Section B: Ease of Banking

1. I find NPCI-based services convenient to use.
2. I am satisfied with the overall convenience provided by NPCI services.
3. I trust NPCI-based apps to handle my payments securely.
4. I rarely face failed transactions while using NPCI services.
5. I find it easy to complete transactions without needing help.

Section C: Accessibility and Challenges

1. I can access NPCI services anytime and anywhere.
2. NPCI platforms work well in my area (Urban/Rural).
3. I rarely face technical issues while using NPCI services.
4. I have received enough information/training from my bank or app about using NPCI services.
5. NPCI services are inclusive and easy for people with limited digital skills to use.

Demographic Section

Age Group:
Gender:
Area of Residence:

Appendix B – UPI & IMPS Transaction Data (Secondary Data Reference)

Monthly transaction volume and value (Apr 2016 to Dec 2024)
Data Source: NPCI official product statistics
https://www.npci.org.in/what-we-do/upi/product-statistics
https://www.npci.org.in/what-we-do/imps/product-statistics