

31 *This study examines the impact of digital transformation on India's financial sector, emphasizing*
32 *UPI as a key driver of paperless transactions and as a modern tool that complements IKS. It*
33 *analyses changes in consumer payment behaviour, particularly post-pandemic, and highlights*
34 *UPI's growth, usage, and significance compared to other digital payment modes. The study also*
35 *underscores the role of UPI in enabling inclusive financial access, reducing dependency on*
36 *cash, enhancing transparency, and integrating traditional economic behaviours into a digitally*
37 *empowered economy.*

38 **Keywords:** *Credit on UPI, UPI Lite X, Biometric UPI, UPI Circle, Enhanced Transaction Limits,*
39 *Indian Knowledge Systems*

40 **BACKGROUND**

41 In April 2009, the National Payments Corporation of India (NPCI) was established to integrate
42 and standardize all retail payment mechanisms in India. At that time, the Reserve Bank of India
43 (RBI) reported an average of just six non-cash transactions per capita annually, despite over 10
44 million retailers accepting card payments. Cash transactions contributed significantly to black
45 money and corruption, prompting RBI to release a vision statement in 2012 focused on creating a
46 safe, efficient, accessible, inclusive, and interoperable payment and settlement system, also
47 supporting the Green Initiative to reduce paper use.

48 The Unified Payments Interface (UPI) was officially launched in 2016 for public use under NPCI
49 guidance, designed to be simple, secure, and interoperable. UPI works on a four-pillar push-pull
50 model, with front-end payment service providers (PSPs) and back-end banks handling
51 settlements. Its success has made it one of India's most significant deep-tech financial
52 innovations. By 2020, India became the world's largest real-time payment market, recording
53 25.5 billion transactions, surpassing China, South Korea, Thailand, and the United Kingdom.

54 The government and RBI have continually enhanced UPI features, including increasing
55 transaction limits for IPOs from ₹100,000 to ₹500,000, proposing cardless ATM withdrawals via
56 QR codes, and launching UPI Lite X and VOICESE to facilitate offline and voice-based
57 transactions for feature phone users in multiple regional languages. Globally, countries such as
58 Brazil, Bahrain, Saudi Arabia, Singapore, the United States, and the European Union are
59 exploring UPI-like systems.

60 The evolution of digital money predates UPI, with early concepts such as David Chaum’s “Blind
61 Signatures for Untraceable Payments” in 1983 and Digicash in 1989. E-Gold in 1996, PayPal in
62 1998, and Bitcoin in 2009 further revolutionized online and decentralized currencies. These
63 systems demonstrated the potential of digital cash and blockchain-based currencies, laying the
64 foundation for India’s adoption of UPI as a real-time, secure, and widely accessible digital
65 payment infrastructure.

66 **INTRODUCTION**

67 **Connection of IKS to Present UPI System:**

68 UPI represents a modern financial innovation that can be linked to Indian Knowledge Systems
69 (IKS) through its ability to integrate traditional, community-based economic practices into a
70 digital framework. Historically, IKS encompassed barter systems, local trade, and communal
71 financial management, where transactions were based on trust, social relationships, and
72 reciprocity. UPI, with its real-time, secure, and traceable transactions, acts as a digital
73 counterpart to these practices, enabling local communities, small vendors, and artisans to
74 participate in formal financial systems while maintaining the ethos of trust and accountability
75 inherent in IKS.

76 Features like UPI Lite X for offline payments, multilingual support, and low-value transactions
77 make it accessible to rural and semi-urban populations who previously relied on informal
78 financial methods. By bridging traditional economic behaviors with digital payment
79 infrastructure, UPI not only promotes financial inclusion, transparency, and economic
80 formalization but also preserves local socio-economic patterns, demonstrating how modern
81 technology can complement and enhance the principles of IKS in India.

82 The Indian banking sector has undergone major structural reforms with the adoption of advanced
83 information and technology, shifting from paper-based to digital transactions. The COVID-19
84 pandemic further accelerated this transition, with contactless payments preferred over cash due
85 to social distancing. UPI, launched by NPCI, enables instant money transfers via smartphones
86 24x7, contributing to India’s emergence as a global leader in digital payments and supporting a
87 less-cash, digitally empowered economy.

88

90 **Objective**

- 91 • To examine the role of UPI in enabling seamless interoperability, real-time accessibility, and
92 cost-efficient digital transactions within India's financial ecosystem, while integrating
93 traditional, community-based economic practices.
- 94 • To analyze how UPI promotes universal financial inclusion, transparency, accountability, and
95 economic formalization through secure and digitally traceable payment systems, linking modern
96 digital payments with the trust-based and socially governed structures of Indian Knowledge
97 Systems.
- 98 • To study the advancement of UPI in terms of enhanced security measures, dynamic
99 authentication, high-value transaction monitoring, and its growing scope of internationalization,
100 ensuring that digital financial systems support both modern requirements and the socio-economic
101 principles embedded in IKS.

102

103 **INSIGHTS**

- 104 • In January 2026, UPI set a new record with 21.7 billion transactions valued at ₹28.33
105 lakh crore.
- 106 • For the full year 2025, UPI processed 228.3 billion transactions, a 32% increase from
107 2024.
- 108 • India now powers nearly 50% of all real-time global digital payments.
- 109 • The "KIRANA EFFECT": Person-to-Merchant (P2M) transactions now dominate,
- 110 • The integration of RUPAY credit cards and pre-sanctioned credit lines on UPI is driving
111 higher transaction values, with over 7.4 million users accessing credit via UPI by mid-
112 2025.
- 113 • New features like biometric authentication for payments up to ₹5,000 are being rolled out
114 to reduce the friction of entering a PIN.
- 115 • UPI Lite X (using NFC) now supports completely offline transactions up to ₹5,000 to aid
116 users in areas with poor connectivity.

117 **SCOPE**

118 The study goes beyond the basic functioning of the Unified Payments Interface (UPI) to examine
119 its wider impact on India's digital payment ecosystem and overall economic structure. It explores
120 UPI's role in promoting a less-cash economy by simplifying banking processes into a single
121 virtual identity and enabling secure, real-time, and mobile-first transactions through the NPCI
122 framework. The research also analyzes how UPI has improved financial accessibility across
123 diverse regions, including remote and rural areas, while reducing reliance on physical currency
124 and enhancing transparency through digitally traceable systems like Direct Benefit Transfers
125 (DBT).

126 The study further considers the expanding applications of digital money in India, including
127 person-to-merchant (P2M) payments, recurring bill payments via platforms such as Bharat
128 Connect, and credit-enabled transactions through RuPay credit cards on UPI. It examines UPI's
129 growing international reach through integration with global payment systems like Singapore's
130 PayNow and the UAE's NEOPAY. Technological advancements such as UPI Lite X for offline
131 payments and UPI 123PAY for feature phone users are included to demonstrate inclusivity
132 across all demographics, from urban users to rural small-scale vendors, reflecting how modern
133 digital payments can complement traditional community-based economic practices aligned with
134 Indian Knowledge Systems.

135

136 **LITERATURE REVIEW**

- 137 • (Kumar & Menon Suseela, 2020): The study entitled, "Impact of Unified Payment
138 Interface System on Customer Satisfaction and Role of National Payment Corporation of
139 India in Promoting Digital Transactions", analyzed customer perception towards various
140 aspects of UPI and understand the relationship between UPI aspects and customer
141 satisfaction. They attempted to identify the major problems faced by customers regarding
142 UPI service access. They found respondents Dimensions of UPI services and customer
143 satisfaction are closely related Majority of the respondents agree with Lack of e literacy
144 and complexity in operation is the most important problems related with UPI services
- 145 • (Baghla, 2018): A study was made to find out the attitude of people towards adoption of
146 digital payments in India and o find out the problems faced by people in making digital
147 transfers. They also attempted to find out the most popular method of digital payments
148 and to have an idea regarding the expected future of digital payments in India. They
149 found that, lack of trust among people in digital payments and Lack of knowledge and
150 awareness among uneducated or less advanced people less reliability due to scams and

151 hacking cases. Loss of internet connection sometimes and delay in cash back processing
152 by E-commerce Companies and e- wallet Companies.

153 • (Kumar & Menon Suseela, 2020): Studied the impact of UPI on customer satisfaction and
154 highlighted the role of NPCI in promoting digital payments in India. They found that
155 digital literacy, ease of use, and trust significantly influence adoption and satisfaction.
156 Challenges such as security concerns and operational complexity were identified,
157 especially among less tech-savvy users. The study concludes that UPI's growth depends
158 on awareness, infrastructure, and user-friendly services.

159 • (*View of IMPACT OF COVID-19 ON DIGITAL PAYMENTS.Pdf*, n.d.): highlights how
160 the pandemic accelerated the adoption of digital payment systems, especially UPI and
161 mobile wallets, due to social distancing and reduced cash use. The study observes a
162 significant increase in transaction volumes and new users, including first-time digital
163 payers. It also notes challenges such as digital literacy gaps, cybersecurity concerns, and
164 infrastructure limitations. Overall, the research concludes that COVID-19 acted as a
165 catalyst for digital financial inclusion and cashless transaction growth in India.

166 • ("Impact Of The First Wave Of Coronavirus On Upi Payments: A Major Boost To
167 Digitalization," 2021) : The study by Bohra, Agarwal & Prakash (2021) found that the
168 first wave of the COVID-19 pandemic acted as a catalyst for UPI adoption, pushing more
169 users toward digital transactions due to concerns about virus transmission through cash. It
170 highlights that despite a short-term dip in transaction value during initial lockdowns, UPI
171 usage increased as users preferred contactless payments. The research identifies cost
172 efficiency, speed, mobility, and reduced cash handling as key factors behind UPI's
173 growth. Overall, the paper concludes that COVID-19 significantly boosted digitalization
174 and strengthened UPI's role in India's payment ecosystem.

175 • (Tyagi et al., 2022): an empirical study on digital payment applications in India, focusing
176 on the adoption and usage patterns of major UPI apps like PhonePe, Google Pay,
177 Amazon Pay, Paytm, and BHIM. Their research, based on a survey in the Pune region,
178 found that UPI adoption is increasing rapidly due to factors such as ease of use, instant
179 transactions, and security features. They also observed that demographic and
180 technological trends are driving a shift from cash to digital payments. The study
181 concludes that UPI is likely to maintain its growth trajectory and play a central role in
182 India's digital transaction ecosystem.

183 • (Perkebunan & Papua, n.d.): refers to research or reports *on the digital transformation*
184 *and economic activities in the Papua region's plantation (perkebunan) sector*. Although
185 there is no specific published PDF under this exact citation, related studies show that
186 digital payment adoption and financial inclusion efforts are being explored in Papua,
187 particularly among MSMEs and market vendors, where digital payments are being
188 introduced to traditional markets to increase cashless transactions. For instance, Bank
189 Indonesia launched QRIS digital payments at a traditional market in West Papua to
190 support micro-enterprises adapting to digital financial systems during and after the
191 pandemic. This reflects how digital payment infrastructure is gradually penetrating rural
192 and plantation-linked economies in Papua, highlighting both adoption potential and the
193 need for increased digital literacy and supportive infrastructure in less developed regions.

194 **METHODOLOGY**

195 The study adopts a descriptive research design to examine the adoption and usage of the Unified
196 Payments Interface (UPI) and digital payment systems in India.

197 **Primary data** were collected using a structured questionnaire designed to capture respondents'
198 awareness, usage patterns, and perceptions of UPI-based digital payments. The questionnaire
199 was distributed through **Google Forms**, and responses were collected using the random sampling
200 method to ensure unbiased participation from UPI users. The online mode of data collection was
201 considered appropriate due to the digital nature of the study and the widespread use of electronic
202 payment platforms.

203 **Secondary data** were gathered from various reliable and published sources, including academic
204 journals, research papers, textbooks, RBI and NPCI reports, government publications,
205 newspapers, and authentic websites. These sources provided conceptual understanding and
206 background information on digital transformation, the evolution of digital money, and the UPI
207 ecosystem.

208 The use of both primary and secondary data helped in gaining a comprehensive understanding of
209 the subject and supported the objectives of the study.

210 **Data Analysis**

211 In 2026, the methodology for studying UPI and digital money varies across disciplines,
212 reflecting both technological and socio-economic perspectives.

213 In the Arts, the focus is on the socio-economic impact of financial technology on creative
214 industries and rural livelihoods in India. Research emphasizes how the "frictionless" nature of
215 UPI has democratized the creative economy, allowing local artisans and performers to receive
216 instant payments via QR codes without intermediaries. Field-based impact assessments study the
217 shift from cash to digital literacy among traditionally unbanked communities and the role of
218 Direct Benefit Transfer (DBT) in supporting cultural heritage. The Arts stream also emphasizes
219 vernacular outreach, using storytelling and regional-language campaigns to teach digital safety
220 and grievance redressal. Administratively, educational institutions have standardized the use of
221 UPI Lite X for offline transactions in heritage sites and rural workshops, ensuring that digital
222 finance remains deeply rooted in social inclusion and the preservation of India's creative
223 workforce.

224 In Commerce, the approach is grounded in a "FinTech-First" framework, where curriculum and
225 practice focus on real-time settlement systems and the digital formalization of the economy.
226 Commerce education and industrial practice use a data-driven methodology to analyze
227 transaction cycles, studying how the NPCI framework reduces the "cash-to-cash" cycle for small
228 businesses and MSMEs. Students and professionals employ analytical modeling to study the
229 integration of RUPAY credit lines on UPI, evaluating how digital footprints are being used for
230 algorithmic credit scoring in place of traditional collateral. The methodology also emphasizes
231 regulatory compliance and auditing, teaching automated ledger reconciliation and the tax
232 implications of Zero-MDR (Merchant Discount Rate) policies. Administratively, commerce
233 institutions have moved toward embedded finance, using API-based payment gateways for
234 seamless fee management and AI-driven risk assessment for high-value transactions, preparing
235 the next generation of professionals for a fully transparent and hyper-connected global market.

236 In Science, the methodology is centered on technical architecture, cybersecurity research, and
237 data science. The focus is on cryptographic protocols and API frameworks to ensure transaction
238 integrity, with an emphasis on AI-driven fraud detection that can identify suspicious patterns in
239 milliseconds. Scientifically, the methodology involves stress-testing system scalability to handle
240 over 20 billion monthly transactions and researching NFC (Near-Field Communication) and
241 Bluetooth-based protocols for offline solutions like UPI Lite X. Big data analytics is used to
242 model consumer behavior and optimize network latency. Administratively, science departments

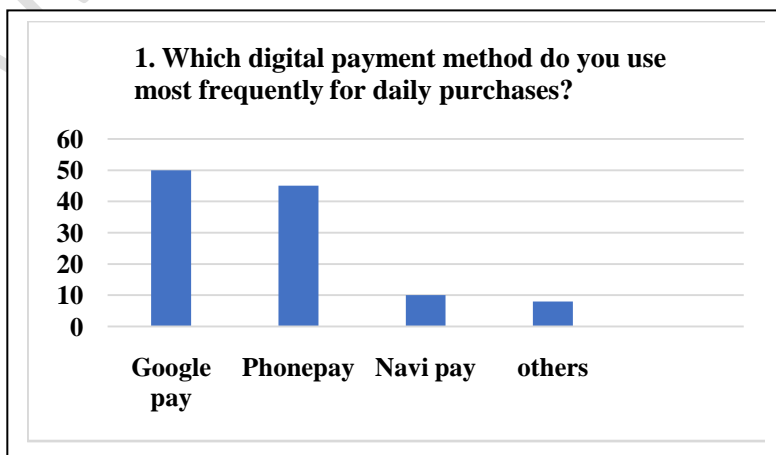
243 are exploring biometric authentication beyond static PINs, testing facial and iris recognition to
244 enhance "risk-based authentication" frameworks, ensuring digital money methodologies
245 prioritize technical security and systemic resilience.

246 The evolution of money provides the historical context for this analysis. Initially, pre-economic
247 gift economies and barter systems functioned on mutual sharing and communal obligation,
248 without standardized measures of value. Commodity money such as salt, shells, and grain
249 emerged, followed by metallic money, paper currency, and credit-based systems. The mid-20th
250 century introduced plastic and credit money, and the digital revolution brought online banking
251 and the Unified Payments Interface (UPI) in 2016. By 2022–2026, Central Bank Digital
252 Currencies (CBDCs) marked the transition to programmable, borderless, and digitally traceable
253 assets. UPI represents a culmination of this evolution, enabling secure, real-time transactions,
254 promoting financial inclusion, transparency, and economic formalization, while connecting
255 modern digital systems with the socio-economic behaviors and community-based practices
256 historically present in Indian Knowledge Systems.

257 Interpretation

258 **1. Which digital payment method**
259 **do you use most frequently for**
260 **daily purchases?**

Particulars	Respondents	%
Google pay	50	44%
phonepay	45	39%
Navi pay	10	8%
others	8	7%
Total	113	100%



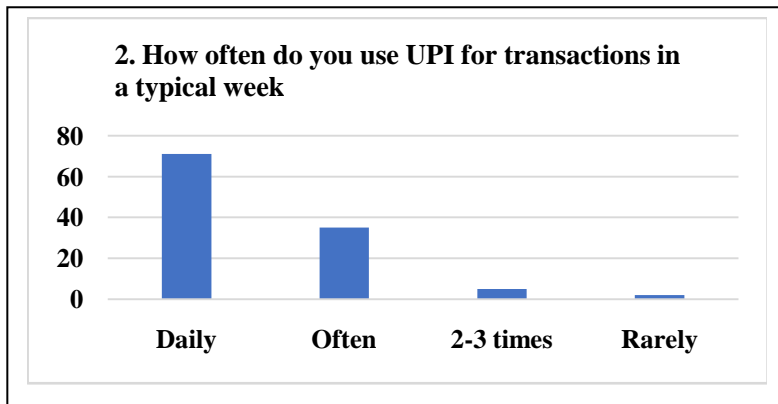
261
262 **Response:** Google Pay is the most preferred payment app with 44% of respondents, followed closely by
263 PhonePe at 39%, showing strong user preference for these two platforms.
264 Navi Pay (8%) and other apps (7%) have significantly lower usage, indicating comparatively limited
265 adoption among respondents.

266

2. How often do you use UPI for transactions in a typical week?

Particulars	Respondents	%
Daily	71	62%
Often	35	30%
2-3 times	5	4%
Rarely	2	1%
Total	113	100%

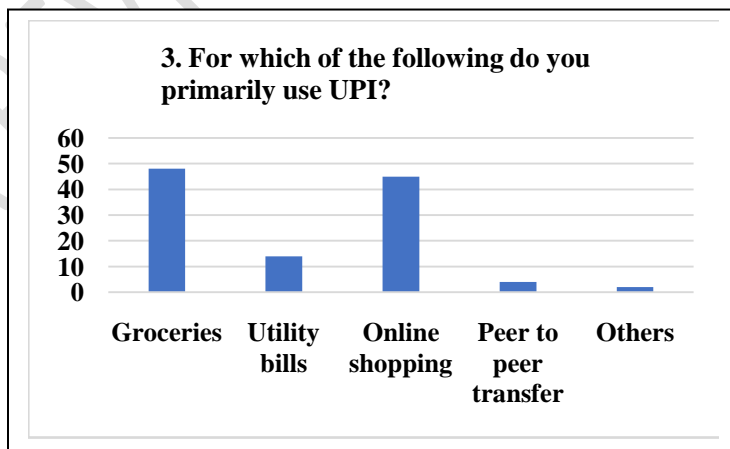
267



268 **Response:** Daily usage is the highest at 62%, indicating that most respondents use the service on a
 269 regular basis, followed by Often at 30%. In contrast, 2–3 times (4%) and Rarely (1%) show minimal
 270 usage, reflecting very limited engagement among a small group of respondents.

271 3. For which of the following do you 272 primarily use UPI?

Particulars	Respondents	%
Groceries	48	42%
Utility bills	14	12%
Online shopping	45	39%
Peer to peer transfer	4	3%
Others	2	1%
Total	113	100%

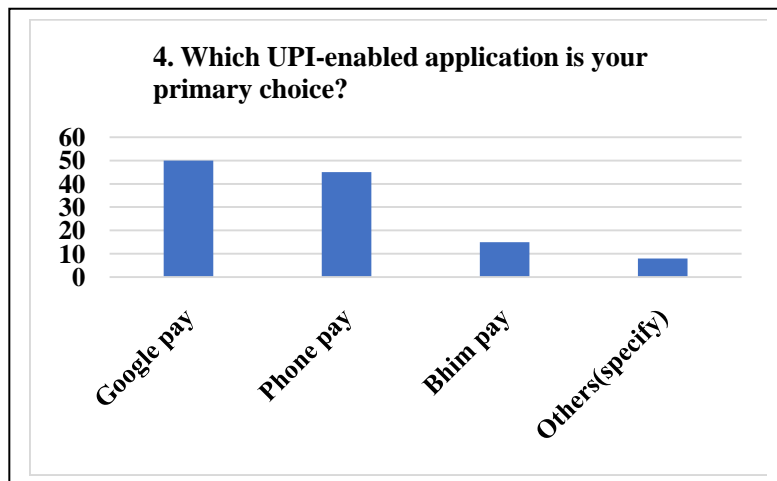


273

274 **Response:** Groceries account for the highest usage at 42%, closely followed by online shopping
 275 at 39%, indicating that most respondents use payments for everyday and digital purchases.
 276 Utility bills (12%), peer-to-peer transfers (3%), and other purposes (1%) show comparatively
 277 lower usage, making them the least common uses among respondents.

278 **4. Which UPI-enabled application is**
 279 **your primary choice?**

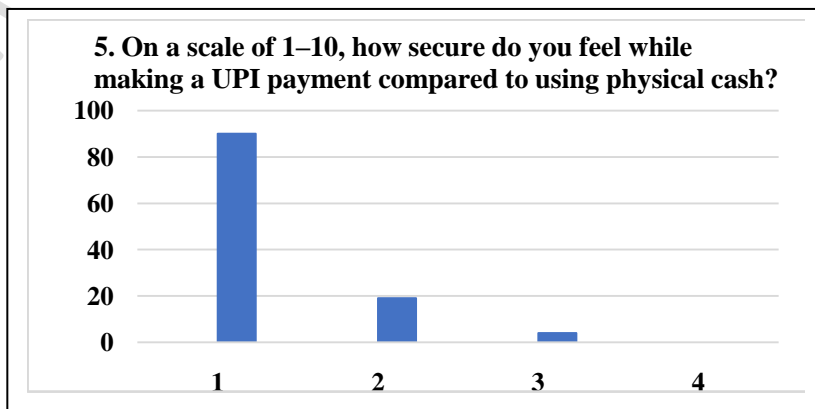
Particulars	Respondents	%
Google pay	50	44%
Phone pay	45	39%
Bhim pay	15	13%
Others(specify)	8	7%
Total	113	100%



280
 281 **Response:**Google Pay ranks highest with 44% of respondents, followed by PhonePe at 39%,
 282 showing that these two apps dominate user preference.BHIM Pay (13%) and other apps (7%)
 283 have lower adoption, indicating comparatively limited usage among respondents.

284 **5. On a scale of 1–10, how secure do you feel while making a UPI payment compared**
 285 **to using physical cash?**

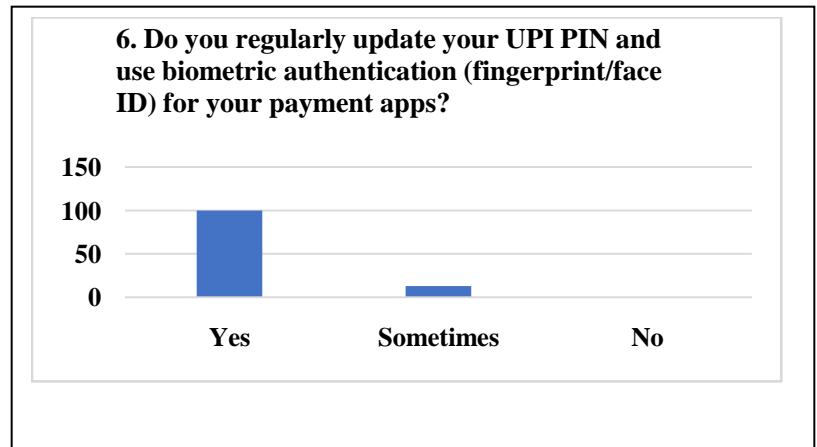
Particulars	Respondents	%
10 to 07	90	79%
06 to 04	19	16%
03 to 01	4	3%
0	0	0%
Total	113	100%



286
 287 **Response:**The majority of respondents fall in the 10 to 07 category (79%), indicating a high
 288 level of usage or satisfaction in this range.This is followed by 06 to 04 (16%), while 03 to 01
 289 (3%) shows very low representation and no respondents fall in the 0 category.

290 6. Do you regularly update your UPI PIN and use biometric authentication
 291 (fingerprint/face ID) for your
 292 payment apps?

Particulars	Respondents	%
Yes	100	88%
Sometimes	13	11%
No	0	0%
Total	113	100%

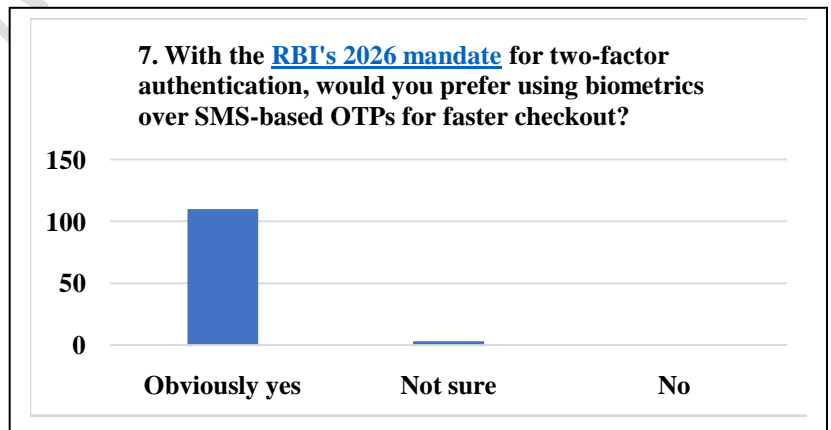


293

294 **Response:**A large majority of respondents (88%) answered Yes, indicating strong acceptance or
 295 agreement toward the factor studied.A smaller group (11%) responded Sometimes, while no
 296 respondents selected No, showing an overall positive response.

297 7. With the RBI's 2026 mandate for two-factor authentication, would you prefer using
 298 biometrics over SMS-based
 299 OTPs for faster checkout?

Particulars	Respondents	%
Obviously yes	110	97%
Not sure	3	3%
No	0	0%
Total	113	100%

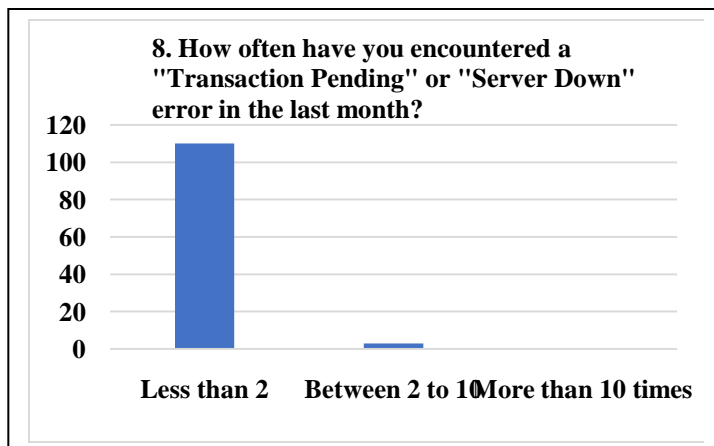


300

301 **Response:**An overwhelming majority of respondents (97%) selected “Obviously yes”, showing
 302 very strong and clear agreement.Only 3% were not sure, and no respondents chose No,
 303 indicating almost unanimous positive opinion.

304 **8. How often have you encountered a "Transaction Pending" or "Server Down" error**
 305 **in the last month?**

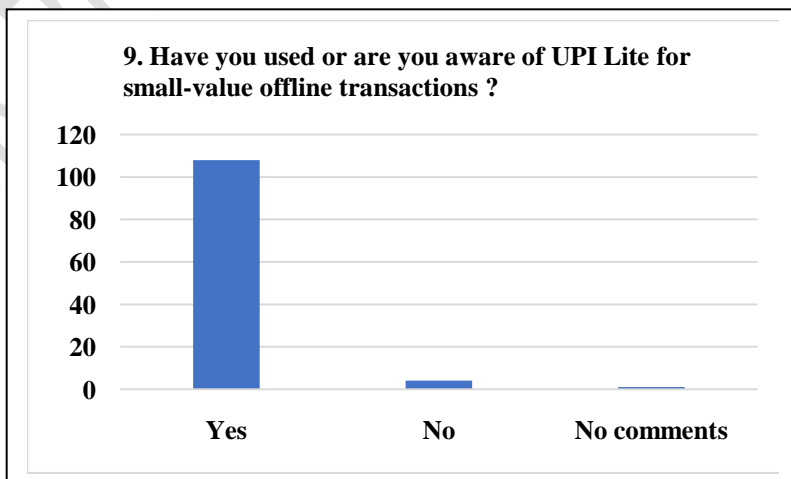
Particulars	Respondents	%
Less than 2	110	97%
Between 2 to 10	3	3%
More than 10 times	0	0%
Total	113	100%



306
 307 **Response:**The vast majority of respondents (97%) fall under less than 2, indicating minimal
 308 frequency or occurrence.Only 3% are in the 2 to 10 range, while no respondents reported more
 309 than 10 times, showing very low overall intensity.

310 **9. Have you used or are you**
 311 **aware of UPI Lite for small-**
 312 **value offline transactions?**

Particulars	Respondents	%
Yes	108	95%
No	4	3%
No comments	1	0.80%
Total	113	100%



313
 314 **Response:**Most respondents (95%) answered Yes, indicating a strong positive response toward
 315 the given aspect.Only 3% said No, and 0.8% gave no comments, showing minimal disagreement
 316 or uncertainty.

317

318

319 **Findings**

320 **1. UPI Adoption and Usage**

- 321 • Google Pay (44%) and PhonePe (39%) are the most widely used UPI applications,
322 highlighting their dominance in the Indian digital payments ecosystem.
- 323 • 62% of respondents use UPI daily, indicating that the platform has become an integral
324 part of routine financial transactions.
- 325 • Major usage includes groceries (42%) and online shopping (39%), demonstrating UPI's
326 role in both everyday needs and digital commerce. These patterns show how UPI has
327 successfully transitioned traditional community-based exchanges into a formal digital
328 framework.

329 **2. Financial Inclusion, Trust, and Transparency**

- 330 • A vast majority of respondents (95–97%) expressed trust in UPI, reflecting high
331 confidence in secure and digitally traceable transactions.
- 332 • Minimal operational issues were reported, with 97% of users facing fewer than two
333 problems, indicating system reliability and accountability.
- 334 • UPI contributes to economic formalization by digitally recording transactions and
335 reducing dependency on cash, thereby bridging informal community-based financial
336 practices with modern digital systems, aligning with the principles of Indian Knowledge
337 Systems.

338 **3. Security and Technological Advancement**

- 339 • Users perceive high levels of security, dynamic authentication, and fraud protection as
340 major strengths of UPI.
- 341 • The surge in adoption following the COVID-19 pandemic demonstrates UPI's capacity
342 for high-value transactions and readiness for broader applications, including
343 internationalization.

- 344 • While adoption is widespread, minor barriers persist among older users or those with
345 lower digital literacy, highlighting the need for targeted awareness campaigns to ensure
346 inclusive access across all demographic groups.

347

348 **Conclusion**

349 UPI has emerged as a highly effective and widely adopted digital payment system in India,
350 enabling seamless, real-time, and cost-efficient transactions. The high daily usage and preference
351 for apps like Google Pay and PhonePe show that UPI is deeply integrated into everyday financial
352 activities such as groceries and online shopping. Its features ensure interoperability across banks
353 and apps, while secure authentication and minimal operational issues enhance user trust and
354 reliability.

355 Moreover, UPI not only drives financial inclusion, transparency, and economic formalization,
356 but it also aligns with Indian Knowledge Systems (IKS) by integrating traditional financial
357 practices into a modern, traceable, and accessible framework. By bridging local economic
358 behaviors with digital infrastructure, UPI supports inclusive growth, preserves community-based
359 economic interactions, and demonstrates how modern technology can complement and enhance
360 traditional knowledge systems in India's diverse socio-economic landscape.

361

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