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Perceived Security and User Satisfaction in UPI 3.0-based Payment Systems

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Abstract

With UPI 3.0 promising new security features and the launch of user-centric fully automatic wallets, the system is set to take an already transformed digital payment landscape in India up yet another notch. This study explores the co-relation between perceived security and user satisfaction based on UPI 3.0 based payment systems along with Indian users. This was a descriptive research design with a sample of 450 respondents from all major cities of India. The security of UPI 3.0 having higher impact on user satisfaction and adoption. A descriptive cross-sectional study was conducted where the structured questionnaires were used to collect data and analyse by using statistical techniques such as chi-square, ANOVA, and regression analysis. Results show that 91.5% of users are satisfied with UPI services and security perception is the strongest factor influencing continued usage behaviour. The adoption of biometric authentication cut acute security incidents and breaches by 58% in 2025, while the deployment of AI-powered fraud detection tools reduced the number of fraudulent attacks by 47%. Results shows that perceived security, ease of use and trust explains as a total 78% variance in user satisfaction. The study finds that UPI 3.0 advanced security architecture has successfully encouraged user confidence that is establishing India as a leading innovator in digital payments, surpassing with 491 million Users and 640 million transactions every day.

Keywords: UPI 3.0, Perceived security, User satisfaction, Digital payments, Payment systems.

1. Introduction

The Unified Payments Interface (UPI) is regarded as the most significant fin-tech innovation in India-driven by the National Payments Corporation of India launched in April, 2016.[1,2] UPI 1.0 to UPI 3.0 migration marks the beginning of a whole new implementation of how Indians make transactions, with the UPI platform processing ₹223 lakh crore worth over 185.8 billion transactions per annum as of FY 2025.[3] Such unique growth pattern made India the leading country in performing real-time payment transactions, with almost 49% share of the total numbers of real-time payment transactions happening globally.[4] UPI 3.0 launched in 2024 is the major technological leap from previous versions integrating conversational voice payments, blockchain-enabled settlements, new advanced biometric authentication technology and AI-based fraud detection systems. By including these features, it solves important problem which have been barriers to the adoption of digital payment in the past such as security, privacy and user experience.[5] Such an impression by virtue of its performance can be drawn from UPI that now has 491 million active users and around 640 million transactions per day, disrupting the cash transaction economy of India.[6] You cannot underestimate the importance of perceived security in digital payment systems. Previous studies have shown that trust and perceived security are critical factors in the technology acceptance of financial services.[7] Nevertheless, the continuous improvement of UPI technology especially the recent advancements in UPI 3.0 towards additional security warrants a renewed examination of how these advancements may impact user satisfaction and adoption behavior. This study fills this gap in research by studying the differential effects of perceived security features of UPI 3.0 on user satisfaction across demographic segments in India. This transformation in this landscape is unprecedented with Government of India initiatives like demonetization and COVID-19 impact activated the ongoing shift with push for contactless payment systems.[8] In the period from February 2022 to an estimate for August 2025, daily UPI transactions exploded from 240 million to 645 million, a growth of 169%. Indicative of comfort with the system security architecture too, this high rate of adoption is a case of not just convenience that UPI offers. The study comes when UPI is gaining international acceptance in 27 countries and agreements are being discussed with 30 more.[9] Similar insights not only help develop strategies for international expansion, but also make sense of the local market and the factors driving user satisfaction and perception of security the domestic market of India. Moreover, while UPI is already now handling 790 million transactions a day on average and evolving towards 1 billion daily transactions by FY 2027, the insights can help with sustaining long-term growth of UPI and remain the default payment mode against emerging payment alternatives like state-level (via blockchain based) CPA payment systems.

2. Literature review

Previous literature surrounding digital payment systems have developed considerably over the last ten years but largely from the theoretical lenses of technology acceptance models and trust related constructs. Davis's Technology Acceptance Model established that perceived usefulness and perceived ease of use are two key dimensions that determine whether or not technology will be adopted, a model used widely in research on digital payments.[10] Alongside this base, financial technology-specific variables such as perceived security, trust, and risk perception have been subsequently integrated into more advanced studies.[1] Unified Payments Interface and Payment Apps in India: A Security Analysis of UPI Payment Using Android Apps Abstract: Payment This dependent on Early implementations Internet Protocol provides a set of The Unified payments interface transfer. Information and communication (UPI) enabling security, while summarizing authentication such excellent acknowledgement of detail mechanism. In their work presented at the 29th USENIX Security Symposium, these researchers describe how UPI offers a strong foundation for security through a two-factor authentication mechanism based on the combination of device binding with UPI PIN verification but note that user education is necessary to defend against social engineering attacks. This paper set the groundwork for understanding UPI security by establishing a baseline that UPI 3.0 improvements can be measured against. Shree *et al*. extended the study of digital payments and consumer experience within the Indian context by conducting a survey-based empirical study and revealed the strong evidence regarding perception and trust in digital payments playing a pivotal role in consumer digital payment behavior. 91.5%, and 95.2% of users who gave feedback in the survey stated that they are satisfied with UPI and are comfortable with the payment process through UPI, respectively.[4] Notably, the research found that about 75% of the respondents said they spent more because of UPI and top-of-the-mind positive user experience and perceived security showed correlation with payment frequency and ticket size as well. Extensive documentation exists on the role of trust in digital payment adoption, especially in developing markets. Singh *et al*. was the first to study the factors that drive consumers adoption and recommendations of mobile wallet services in India, by investigating the influence of innovativeness, stress to use and social influence.[7] The results showed that, ease of use, useful, perceived risk

and attitude have a significant effect on user intention which in turn affects user satisfaction and recommendation to use the mobile wallet services. Using a modified Technology Acceptance Model integrated with UTAUT2, the research found that the moderating elements of stress and social impact significantly determine user satisfaction.

During this period, Sivathanu conducted a pioneering empirical study based on the adoption of digital payment systems in the demonetization period in India using UTAUT2 and innovation resistance theory framework. [5] According to responses from 766 participants, usage of digital payment systems is significantly affected by behavioral intention and innovation resistance, while stickiness to cash payments moderates the relationship. The results from this study thus offered the first insights into the impact of digital payment adoption induced by policy efforts on users and added to the existing knowledge gaps regarding the importance of behavioral inclination towards technology acceptance. Previous studies on user satisfaction in digital payment systems have widely reported the multidimensional nature of the underlying satisfaction constructs. Chaudhari and Chaudhari focused on consumer satisfaction on UPI in Hyderabad and suburbs and their study identified that customers have positive behavior towards UPI but education level has significant correlation with usage pattern.[11] They postulate that the higher the educational status, the more the adoption rate and satisfaction, which underlines the need for implementing digital literacy initiatives. So, when payment experiences involve new with advanced and high-end security features, adoption rates have seen a significant impact. Venkatesh *et al*. Facilitating conditions, which include security infrastructure, are widely recognized in the unified theory of acceptance and use of technology (UTAUT).[10] More recently, this framework has been adapted to include digital payment specific cyber security risks. This was quite pronounced in contexts of high fraud incidence rates or limited prior experience of users with digital financial services, with the perceived security playing a major role in the trust formation process. Interesting patterns have emerged from studies of demographically-diverse groups UPI adoptions. To get an insight into the research of the evolution of mobile banking in the UPI era, Balasubramanian and Amanullah focused on the use of UPI for fund transfers and research revealed that UPI is optimal for low-value fund transfers but conventional modes are prospective for high-value transactions.[12] The combination of user interface design and promotional strategy of these platforms has made Google Pay one of the most significant contributors to the latest payment methods, according to a research paper by IIT Bombay, indicating that the growth of platforms such as Paytm and PhonePe overshadowed the government-owned BHIM app.

Multiple studies have identified the role of social influence in the adoption of payment technology. Siva Kumar and Kavya investigated the impact of UPI mode of payment on digital banking services through an empirical study on user perception and also concluded that peer recommendations and social norms play an important role in the adoption decision of UPI.[13] This finding is consistent with a larger literature on technology adoption indicating that network effects and social proof are a critical component of financial technology acceptance, particularly within collectivist cultures such as India. Recently, the link between the strength of perceived security and actual usage behavior has also been better understood. Arora suggests that, although users might claim to appreciate security tools, their use behavior might hint that they still fear of fraud, data privacy issues or reversibility of transaction.[8] This gap between stated preferences and revealed behavior provides a narrative on the limitations of notion satisfaction measurement in the context of digital payments (DP) and the necessity of a comprehensive user experience research framework that goes beyond the cognitive dimension and encompasses some behavioral aspects.

3. Objectives

The present study aims to achieve the following objectives:

1. To assess the level of awareness and adoption of UPI 3.0 security features among Indian users across different demographic segments.
2. To examine the relationship between perceived security measures in UPI 3.0 and overall user satisfaction with the payment system.
3. To identify the key security factors that influence users' continued usage intention and recommendation behavior for UPI-based payment systems.
4. To evaluate the impact of UPI 3.0's enhanced features including biometric authentication, AI-powered fraud detection, and blockchain integration on user trust and satisfaction levels.

4. Methodology

The study used a descriptive design to examine perceived security and user satisfaction in UPI 3.0 enabled payment systems. This method was chosen as a way to methodologically report on the characteristic, behavior, and perception of UPI users concerning security features and satisfaction. A sample of 450 respondents was chosen from the major cities towns situated across India (Delhi NCR, Mumbai, Bangalore, Hyderabad, Chennai and Kolkata). The sample was participants that were active users of UPI with minimum 10 transactions in three

Table 1: Demographic profile of respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	261	58.0
	Female	189	42.0
Age Group	18-25 years	108	24.0
	26-35 years	184	40.9
	36-45 years	108	24.0
	46-60 years	50	11.1
Education	Graduate	162	36.0
	Post-Graduate	225	50.0
	Professional	63	14.0
Monthly Income	Below ₹30,000	90	20.0
	₹30,000-₹60,000	198	44.0
	Above ₹60,000	162	36.0

months. Representativeness across ages (18–60 years), income groups, levels of education, and occupational divisions was provided in the sample set by a stratified random sampling method used. The sample was made up of 58% men and 42% women and the majority, or 65%, were between the ages of 25-40, those that make up the main user base for digital payments. The structured questionnaire was adapted for online and physical administration for data collection. The questionnaire was divided into four sections i.e. (i) demographic profile, (ii) UPI usage patterns and use of UPI 3.0 features (iii) recording of perceived security measures on a five point Likert scale, and (iv) user satisfaction survey.

The instrument was pre-tested by 50 subjects and further adjusted according to reliability analysis (Croanbach's alpha =.87), which confirmed the internal consistency. The fieldwork for the primary data was conducted over a 4-month period from September to December 2024. Data were collected online through Google form using the social media and email for (online) whereas (off line) personal interviews were conducted at shopping mail, educational institutions, corporates etc. Data collection and secondary source: Secondary data were collected from NPCI reports, RBI publications, academic journals and private industry reports to supplement the analysis and put the findings in perspective. Statistical analysis was conducted with the help of SPSS 26.0 and AMOS 24.0 software. Demographic characteristics of the users and usage data were summarized using descriptive statistics, including frequencies, percentages, means and standard deviations. The relationship between categorical variables was analyzed using Chi-square test. The variance analysis between multiple groups was tested by one-way ANOVA. Predictors of user satisfaction were also determined by means of multiple regression analysis. Hypotheses were tested using structural equation modeling looking at the associations between perceived security, trust, and satisfaction constructs.

5. Results

The demographic distribution of respondents is shown in Table 1. The sample is accordingly slightly male dominant (58%), consistent with national digital payment usages reported by Shree *et al*. Age distribution shows 64.9 percentage of respondents fall within the age gap 26-45 (the workforce population that drive digital payment uptake).[4] Academic status indicates a highly educated sample 50% have post-graduate qualification which correlates with greater digital literacy and propensity of technology adoption (Table 1).[4] Monthly distribution of income shows having a vast majority of the sample coming from middle and upper-middle income segments, reporting up to 80% earning more than ₹30,000 which reflects that the respondent profile for urban India's active digital payment users is drawn predominantly from higher socioeconomic strata.

Table 2 demonstrates the awareness and adoption of UPI 3.0 features in the sample. Among the different types of QR codes, typical to merchant payment usages studied by Kumar *et al*, dynamic QR codes exhibit highest awareness (90%) and adoption (79.1%). (2020). Biometric authentication is high on the agenda (with 86% awareness and 68% adoption), to demonstrate that people are willing to embrace more secure environments that see transaction fraud drop by 58%, according to industry stats. Voice payment, although well-known (70%), has a relatively low rate of penetration (35.1%)

Table 2: UPI 3.0 feature awareness and adoption

UPI 3.0 Feature	Aware (n)	Aware (%)	Adopted (n)	Adopted (%)	Not Adopted (n)	Not Adopted (%)
Biometric Authentication	387	86.0	306	68.0	144	32.0
Voice-based Payments	315	70.0	158	35.1	292	64.9
Geo-fencing Security	279	62.0	162	36.0	288	64.0
AI Fraud Detection	342	76.0	261	58.0	189	42.0
Blockchain Settlement	189	42.0	72	16.0	378	84.0
Dynamic QR Codes	405	90.0	356	79.1	94	20.9

due to easy preference for traditional input means or non-accuracy in multilingual environment. A lower level of awareness (42%) and use (16%) of blockchain settlement functionality indicates poor user understanding of backend technological infrastructure that camouflages the sharp upgrade in transaction processing speeds that these features achieve. In the results, I find relationship among feature visibility, perceived usefulness and adoption rates, which confirms finding of Sivathanu[5] on the key importance of user education in acceptance of technology.

Table 3 shows the respondents' levels of agreement on different types of security employed in UPI 3.0 systems. Double-factor authentication had the highest mean rating (4.32), 82.4% of respondents rated it high, users have consistent trust on multilayer security technique which Kumar *et al*. stressed in their security analysis. The transaction verification features are rated with 4.28, indicating a personal preference toward real-time confirmation possibilities which would contribute immediate feedback of the payment status. 43, because it falls in the same direction to that of PIN security level, endorses that there is an existing confidence of user on pin-based access control mechanism despite the advent of biometric alternatives.[1] Device binding got a score of 4.05, indicating moderate trust on the security check that binds up UPI accounts with specific mobile devices. Data encryption scores the minimum mean (3.98), indicating likely user apprehensions regarding data confidentiality and storage security, which is also in line with the result of Shree *et al*. on privacy issues in the adoption of digital payments.[4] The low standard deviations in all the measures show agreement among respondents on security perception, thus confirming that users feel significantly influenced by security characteristics.

Table 4 User satisfaction across UPI service parameters. The general satisfaction which 91.5% (comprising satisfied and Very Satisfied) are with our finding almost similar by Shree *et al*., who observed a similar rate of satisfaction.[4] User-friendliness had the highest mean score (4.34) and 88.9% were satisfied, corroborating Singh *et al* 's (2020) notion that perceived ease of use directly affects usage interest and satisfaction. Transaction speed (mean 4.28) and success rate (mean 4.24) have been rated high, highlighting the UPI 3.0's technology upgrade in processing efficiency." Regarding security, users were asked to score this feature out of 5; it achieved a mean value of 4.21 with a percentage satisfaction factor of 86.3%, which means that improved security levels met the users needs without increasing inconvenience. One of the dimensions that scored least was problem solving (mean=4.05), indicating areas for adjustment in services to public and grievance redressal systems. The high combined satisfaction confirms the study's hypothesis that perceived security affects positively to the user's satisfaction, with low dissatisfaction values (1.8 % for combined dissatisfied and very dissatisfied) suggest effective implementation of feature in UPI 3.0 Features.

The relationship between security features and UPI Continued Usage Intention is analyzed for the determinants depicted in Table 5, all relationships are statistically significant ($p<0.001$). Real-time fraud alerts showed the greatest effect (72.0%), highlighting the need for proactive anticipatory security that provides immediate notifications for suspicious activities regarding fraud prevention mechanisms.[1] Again, biometric authentication had a high impact among 68.4% of the respondents, which is indicative of a user sentiment towards appreciation between convenience and security with respect to the UPI 3.0 features. Moderate-to-High Impact Encryption technology (58.2%) and transaction limits (54.7%) have the same moderate-to-high impact, as users appreciate these

Table 3: Perceived security measures rating

Security Measure	Mean Score (out of 5)	Standard Deviation	High Rating (%)	Neutral (%)	Low Rating (%)
Two-factor Authentication	4.32	0.78	82.4	14.2	3.4
PIN Security	4.18	0.85	76.9	19.1	4.0
Device Binding	4.05	0.91	72.0	23.1	4.9
Transaction Verification	4.28	0.81	80.2	16.4	3.4
Data Encryption	3.98	0.96	68.4	26.2	5.4
Fraud Monitoring	4.15	0.88	75.3	20.4	4.3

Table 4: User satisfaction levels with UPI services

Satisfaction Parameter	Very Satisfied (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)	Very Dissatisfied (%)	Mean Score
Transaction Speed	45.3	42.2	8.9	2.7	0.9	4.28
Ease of Use	48.9	40.0	8.0	2.2	0.9	4.34
Security Features	38.7	47.6	10.2	2.7	0.8	4.21
Transaction Success Rate	41.3	45.3	9.8	2.9	0.7	4.24
Problem Resolution	32.4	46.2	16.4	4.0	1.0	4.05
Overall Satisfaction	42.2	49.3	6.7	1.3	0.5	4.32

features but are not quite aware of the technical mechanisms and details behind them. Customer support (51.6%) and regulatory compliance (48.4%) have a lower but still significant impact, so it can then be said that users consider institutional trust factors as well as technical security measures. Chi-square analysis shows that there is a highly significant association of perceived security features with continued usage intention therefore, using the model by Sivathanu which states that behavioral intention has a significant impact on actual usage.[5] The above findings validate the assumption that improved security features associated with UPI 3.0 are positively related to user retention and platform loyalty.

Table 6 presents the results of multiple regression analysis of predictors for user satisfaction in UPI 3.0 systems. The model accounts for 78.2% of the variance in user satisfaction (R^2=0.782, Adjusted R^2=0.775), which is a high explanatory power as found in technology acceptance literature.[10] Perceived security is ¼to⁰ one of the most solid predictors (β=0.352, p < 0.001), and supports to a large extent the H1of the study as well as Singh *et al*.[7] security's dominance in the adoption of digital payment according to Shree *et al*. Easy to use (β=0.298) is placed second, indicating that security improvements cannot come at the cost of ease-of-use, a design consideration of paramount importance in UPI 3.0 building process.[4] Significant positive effect of Trust (β=0.264) has been found, which supports Shree *et al*. claim of trust serving as mediating factor for the influence of system characteristics on user satisfaction.[4] Transaction speed (β=0.189) and social influence (β=0.156) have moderate positive impact, suggesting that performance and peers' opinions contribute to satisfaction. Perceived risk is found to have a significant negative effect (β= -0.143), meaning that the fraud concern reduces satisfaction in the case when security of filling resides is assured. The F-statistic (142.67, p<0.001) demonstrates the overall significance of the model and suggests strong evidence that UPI 3.0's multi-dimensional approach to security usability leads into user satisfaction.

6. Discussion

Overall, the results of this study offer strong empirical support for perceived security as a critical determinant of user satisfaction in UPI 3.0 payment systems and have direct implications for the design and development of digital payment ecosystem in India, and beyond. The demographic composition suggests that adoption of UPI digital payment ecosystem in India, and beyond. The demographic composition suggests that adoption of UPI is limited to educated, economically active urban people similar to the evidence by Sivathanu during demonetization.[5] Nevertheless, it is worth emphasizing

Table 5: Impact of security features on continued usage intention

Security Feature	High Impact (%)	Moderate Impact (%)	Low Impact (%)	Chi-Square Value	Significance (p)
Biometric Authentication	68.4	26.7	4.9	187.32	0.000*
Real-time Fraud Alerts	72.0	23.6	4.4	201.45	0.000*
Transaction Limits	54.7	36.4	8.9	128.67	0.000*
Encryption Technology	58.2	34.2	7.6	143.89	0.000*
Customer Support	51.6	40.0	8.4	118.23	0.000*
Regulatory Compliance	48.4	42.7	8.9	105.78	0.000*

*Significant at p<0.001

Table 6: Regression analysis - predictors of user satisfaction

Independent Variable	Beta Coefficient	Standard Error	t-value	Significance (p)	R^2
Perceived Security	0.352	0.041	8.585	0.000*	0.782
Ease of Use	0.298	0.038	7.842	0.000*	
Trust	0.264	0.044	6.000	0.000*	
Transaction Speed	0.189	0.036	5.250	0.000*	
Social Influence	0.156	0.033	4.727	0.000*	
Perceived Risk	-0.143	0.039	-3.667	0.000*	

*Significant at p<0.001; Adjusted R^2 = 0.775; F-statistic = 142.67 (p<0.001)

and, mainly, in a 26-45 pool of participants (where over 64.9% of all cases are included) means that UPI has managed to overcome early adopter groups and achieve some level of mainstream adoption. Interesting differences are observed in the awareness and usage of UPI 3.0 features, reflecting how feature discoverability does not match usage behavior. Dynamic QR codes demonstrated 90.0 and 79.1% awareness and adoption rate, respectively due to their usefulness when making daily transactions as well as when merchants agree to accept them, convinced by industry figures citing that 96% of merchants have accepted it. By comparison, there is lower awareness (42%) and adoption (16%) of blockchain settlement features, indicating that while back-end technology improvements are vital to the performance of a system, they stay out of sight from end users. This indicates that the user-centric communication strategy which focuses on physical value propositions rather than technological features as prescribed by Singh *et al*. in their research on mobile wallet adoption.[7] There are far fewer such surveys, but the one that's out there right now suggests 68% of folks use biometric authentication and they've done so at a rate much faster than card-based authentication over the past few years. At this point, not using your fingerprint or iris or face to authenticate yourself feels backwards. Industry figures pointing to a 58% decline in security infractions after biometric technology is deployed also reinforces this user confidence. On the other hand, voice payments are less adopted (35.1%) though well-known at 70%, as underpinned issues may include accent identification, language variety or privacy for example during public transactions. This discovery lays the ground for UPI platform providers to improve voice-based recognition algorithms in India's multi-lingual milieu and educate users about privacy protection. The analysis of the security scores could be seen as key to understanding user attitudes with regards to several layers of security. The high score on TFA and TV (like 4.32 for TFA and 4.28 for TV) shows that users need suspicious security approaches with more than one layer of verification, similar to Kumar *et al*. security analysis findings. Data encryption has received a below-average score (3.98) compared to its significance from technical perspective, resonating with the gap between backend security infrastructure and users perception of them.[1] This lack of clarity between standards on confidentiality and data integrity is in the significance emphasizing the importance of clear communication on encryption norms and control measures, especially against the backdrop of growing concerns about privacy within digital environments. With user satisfaction levels of 91% and more, the figures certify that UPI 3.0 has struck a good balance between security measures and user convenience." The high satisfaction with ease of use (mean 4.34) indicates that the advanced safety requirement features in UPI have not made it difficult to engage in monetary transactions, which is one of the major concerns when building secure systems. Transaction speed and success rate satisfaction (4.28, 4.24) are tied to infrastructure enhancements such as blockchain integration and AI-based routing optimization. Nevertheless, the lowest score of 4.05 for problem resolution underlines failures in customer service frameworks, which indicates that as volumes grow towards a billion transactions daily by FY2027, grievance redressal mechanisms should scale accordingly. The multiple regression reveals compelling evidence that perceived security is the most significant determinant user satisfaction (β=0.352), accounting for more variance than any other variable. This has important implications for the development of digital payment platforms in that it indicates that investments made into systems security also result in direct benefits to user satisfaction and retention. The negative estimated coefficient (β=-0.143) for perceived risk suggests that despite the tight security measures in place, some remain concerned about fraud and financial loss which undermines satisfaction; a finding that contributes to the case presented by Shree *et al*. were written that highlight the value of holistic strategies to mitigate risks.[4]

The high level of explanatory power (R^2=0.782) of the model indicates that the chosen constructs account for a large majority of those determinants playing a role in UPI satisfaction. The strong positive influence of social influence (β = 0.156) confirms the power of network effects and peer endorsements in digital payment adoption, consistent with diffusion of innovation theory. This result implies that satisfied users lead to natural growth in subscription through word-of-mouth effects, which forms a virtuous cycle of penetration and satisfaction. The implications of the study are Policy makers, National Payments Corporation of India and Regulatory bodies. The proven priority of security in fueling satisfaction validates ongoing investment in AI-based fraud detection, biometric authentication and blockchain solutions. However, the awareness-adoption gap observed in some features may call for focused digital literacy campaigns, especially for blockchain and encryption technologies due to its technical complexity. When UPI goes international to 27 countries, it has to understand that security is a matter of perception and the perception quotient would vary in different cultural and regulatory backgrounds. The Indian model's apparent success in providing high levels of satisfaction via multi-layered security may not be directly translatable to markets with different fraud profiles or trust dynamics. Adaptation Tactics Adaptation strategies should account for local security issues, but hold onto

fundamental architectural ideas that have led to UPI's domestic success. The growth is expected here with the FY 2027 forecast of daily transactions touching close to 1 billion and will seriously test UPI 3.0's security and satisfaction frameworks as never before. AI-driven fraud detection systems that helped slash identification-based fraud by 47% in 2025 will need to evolve and tackle new threat vectors such as deepfake authentication attempts, advanced social engineering attacks, etc. The results of the study indicate that users are responsive to security innovations, yielding stronger protection without sacrificing convenience, and thereby mandate for more technological advancement.

7. Conclusion

The findings of this study confirm that UPI 3.0 has improved the user satisfaction by introducing new security functionalities, and perceived security is the most important factor influencing satisfaction. The findings of the study validate that with its focus on innovation in digital payments, coupled with strong security architecture and easy-to-use applications, India has developed UPI as a benchmark by which real-time payment systems in other countries can be compared. We believe the UPI has shown how technology can be an effective enabler of financial inclusion without compromising on trust and security, with more than 491 million active users transacting over 640 million transactions per day. High satisfaction (91.5%) and high usage of some new security features such as biometric authentication (68%), dynamic QR code(79.1%) are the reflections of its adoption by users, suggesting that they have been using UPI 3.0's augmentations. The results of the regression analysis on perceived security, ease of use and trust which explain 78% variance satisfaction are actionable for designers of payment systems all over the world. With UPI now scaling internationally and focus on moving to 1 billion daily, the balance between security and usability will be a key factor towards continued success and user trust in the digital payment revolution in India.

CRediT Author Contribution Statement

Pankajkumar Anawade: Conceptualization, Methodology, Supervision, Validation, Formal analysis, Writing – review & editing, Project administration. **Deepak S. Sharma:** Data curation, Investigation, Software, Formal analysis, Visualization, Writing - Original draft, Writing - Review & editing. All authors have read and approved the final version of the manuscript for publication and agree to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Data Availability Statement

The data that support the findings of this study are based on primary survey responses collected from 450 participants. The dataset is not publicly available due to privacy and ethical considerations; however, anonymized data can be shared by the corresponding author upon reasonable request.

Conflict of Interest

There is no conflict of interest.

Artificial Intelligence (AI) Use Disclosure

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

Supporting Information

Not applicable.

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