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UNDERSTANDING THE ADOPTION OF DIGITAL PAYMENT: AN ECONOMIC PERSPECTIVE ON UPI APP USAGE AND SECURITY PERCEPTIONS

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Abstract

Globalization has driven rapid digital transformation, with India witnessing significant economic advantages, such as cost reduction and time efficiency. The Unified Payments Interface (UPI) plays a crucial role in bridging the gap between consumers and businesses. This study examines how UPI is transforming lives, though it also introduces security risks. In 2024, India registered 2,92,800 cybercrime cases, costing the economy Rs. 2054.6 crores, expected to reach 1 trillion annually by 2033. The research surveys 513 respondents on demographic trends, payment preferences, and security concerns. Findings show high adoption in Ahmedabad and Gandhinagar, especially among younger users. Google Pay leads the market, followed by Paytm and PhonePe. Despite trust in UPI, security issues highlight the need for improved infrastructure to enhance user trust and satisfaction.

Keywords: Cyber Security, UPI, Digital Payments, User Trust, Fraud Prevention, Cyber crime.

INTRODUCTION

Globalization has driven rapid digital transformation worldwide, and India is no exception. This digital revolution permeates daily life, offering significant economic advantages such as cost reduction and time efficiency. Digital platforms facilitate the sharing of assets (e.g., ride-sharing, home-sharing, financial-sharing platforms), leading to new economic models. The evolving global economic landscape facilitates seamless financial transactions, and the Unified Payments Interface (UPI) emerges as a pivotal technology in bridging the gap between consumers and businesses.

This study tries to examine how UPI is transforming the lives of laymen. However, it also poses a threat to security. The total cybercrime registered in 2024 is 2,92,800 cases which cost the Indian economy almost Rs.2054.6 crores. It is expected to reach 1 trillion per annum by 2033. As per the analysis of Data acquired from the Reserve Bank of India in reply to the RTI application of the authors ₹3,207 crore was dealt due to 5,82,000 cyber fraud cases between FY 2020 to FY 2024¹. Indian computer networks are likely to face cyber-attacks of one trillion a year by 2033 and 17 trillion by 2047, the year when India will celebrate its centennial, according to a study by a not-for-profit organization PRAHAR which takes up issues in which common man feels helpless².

Furthermore, a new concept of digital payment system—especially apps that are designed on the foundation of UPI—has transformed the payment system of India at a very fast pace. UPI is a payment system that was launched by the National Payments Corporation of India (NPCI) as the primary rails of the Indian economy's digital payment solutions that facilitation instant and real-time inter-bank transaction between banks. Even till the month of October 2024, it had been established that UPI had successfully handled 16. 58 billion transactions with ₹23.5 trillion. Another boost being that in the fiscal year 2023-24, the UPI reached above 131 billion transactions which was 83 billion in the preceding fiscal year thus it continues to expand its market smoothly. The major players in the industry include PhonePe, Google Pay, Paytm constituting the market and helping consumer and businesses

¹ https://www.thehindu.com/data/cyber-fraud-in-banking-transactions-surges-in-fy24-data/article68813626.ece accessed on 29th December 2024

https://www.thehindu.com/sci-tech/technology/incidents-of-cyberattacks-on-india-may-reach-17-trillion-by-2047-study/article68810313.ece accessed on 29th December 2024



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adapt to the new environment of digital payments. The concept of digitalization due to UPI goes on providing different and effective platforms thereby reshaping the Indian financial sector.

Digitalization provides different kinds of platforms to the consumer and business. However, with the everincreasing popularity of UPI apps, a deep dive into user behaviour and their security perceptions, along with their fraudulent activities response, is pivotal. The paper develops a holistic understanding of the same through data collected from 513 respondents representing Ahmedabad and Gandhinagar. The insights developed through this study have useful policy implications for the regulatory authorities, banks/financial institutions, and UPI app service providers in improving the safety, usability, and trustworthiness of digital payment platforms. In India, following laws related to cyber security and money mulling, Information Technology Act, 2000, Payment and Settlement Systems Act, 2007, Reserve Bank of India's Cyber Security Framework, and Banking Ombudsman Scheme, 2006. Indian legal structure fortifying Cyber security and money mulling regulation is supported by few main laws and policies. The Information Technology Act of 2000 establishes the legal framework for secure electronic commerce, makes computer crimes as identity theft and hacking unlawful and requires organisations to adopt certain suitable security measures to safeguard sensitive information. To this end, the Payment and Settlement Systems Act, 2007 provides for safety, efficiency, and reliability of payment systems, and their development under regulated framework. The Cyber Security Framework of the Reserve Bank of India requires financial institutions to implement rigorous risk analysis, surveillance and fraud prevention processes that greatly minimize vulnerabilities associated with cyber-attacks and other illicit operations such as money mul ling. In the same category, the Banking Ombudsman Scheme, 2006 also provides remedy to customer negligence and provides straightforward access for reporting cyber fraud issues. As a whole, these laws and particularly frameworks renew India's digitally and financially connected environment as they prevent criminal acts, strengthen customer trust, and follow international norms. However, essential limitations of enforcing cybersecurity capabilities, in addition to increasing complexity of cyber threats, cause the set measures to require constant adjustments and active prevention strategies.

"The Role of UPI in Reshaping Financial Transactions within the Economy"

Unified Payments Interface (UPI) has transformed financial systems, brought a plethora of benefits and held significant economic importance. It has fundamentally changed how financial transactions are conducted by offering a fast, secure, and cost-effective payment method. One of its standout features is the enhancement of financial inclusion, providing digital payment options to individuals and businesses alike, particularly those in rural and semi-urban areas where banking services are often limited. By lowering transaction costs for users and financial institutions, UPI enhances the overall efficiency of finance operations, allowing small and medium-sized enterprises (SMEs) to allocate resources towards business growth instead of incurring high transaction fees.

UPI plays a crucial role in promoting a cashless economy and reducing expenses associated with printing, distributing, and managing currency. It fosters transparency in financial transactions, an essential factor in curbing tax evasion and minimizing issues linked to the shadow economy. With its real-time payment capabilities, UPI boosts economic activity, directly contributing to GDP growth by facilitating quicker commerce and more efficient financial processes. Furthermore, it has emerged as a pivotal enabler of the digital economy, empowering businesses, start-ups, and consumers with innovative payment solutions that enhance both efficiency and convenience.

On a broader scale, UPI improves economic stability by increasing the traceability and formalization of financial transactions, which in turn boosts tax compliance and reduces the circulation of black money. By seamlessly integrating international payment systems, UPI plays a critical role in international trade, enabling smooth cross-border transactions. Additionally, it has significantly contributed to creating a competitive ecosystem that drives innovation in the fintech sector, resulting in enhanced services and advancements in technology. UPI empowers both consumers and businesses, catalysing modernization in India's economy, and promoting equitable growth with a strong emphasis on digital finance.

LITERATURE REVIEW

Understanding of new payment environment or Digital Payment Ecosystem and Understanding of UPI Technology

The new Payment Interface dubbed as Unified Payment Interface (UPI) has brought a revolution in the online payment space by enabling real-time inter-personal/ business transactions. The practicality and utility of the system also play principal roles for the ever-emerging cashless society in India. According to Venkatesh, Thong, and Xu (2012), perceived ease of use and perceived utilitarian have been important predictors of use of technologies while Kumar (2019) noted that UPI has revolutionized the digital payments through increasing use of technologies. Nonetheless, there is an increase in UPI usage, and high growth means that UPI requires effective security measures to deal with higher security threats (Bhasin, 2021).

UPI App Usage Patterns



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It may simply mean the transition from cash or credit-card payments to those through UPI. Mehrotra and Shrivastava (2019) observed that this shift is led by; students because they are more technically inclined. A similar conclusion was made by Pathak (2021) where he stated that the youth, the millennials and centennials who are conversant with technologies are the major users of UPI apps. These conclusions corroborate with these discoveries as based on this study, the characteristics of the Gurgaon and Ahmedabad users who predominantly include the younger generation denotes the shift in the payment regimen.

An emerging area is analysing competition and innovation between these apps and within the UPI App Marketplace.

Competition between different UPI apps which includes Google pay, Paytm and PhonePe has led to innovation. Kumar (2019) and Das & De (2020) noted that further development of features and security solutions is crucial for keeping customers' confidence as well as stable market positions. In the same vein, Ali and Ali pointed out that competition leads to the addition of even more consumer- friendly features and incentives, thereby promoting the-picker market concept. In this study, the same conclusion is supported by showing that with competition, consumers gain better services which leads to more user satisfaction.

The analysis of security perceptions and challenges among users and professionals of cyberspace is presented below.

Safety is still a burning question in the digital payment system. Similar to Mai et al. (2018), Luo et al. (2020) posited that trust leads to the use of technology-based payment systems, while security incidents negate user trust. Bansal (2020) pointed out that even though customers rely on UPI systems due to the ease of transactions, there is always a fear of being scammed. PricewaterhouseCoopers (2020) observed that the users shopping for new solutions focus on secure and protected payment channels, hence the importance of security standards. According to Bhasin in his article published in 2021 indicates that proper ways of handling the fraud cases must have efficient ways of solving them. This work builds on such findings to show that although the users deem UPI convenient enough, the unrelenting issue of security requires enhancing the infrastructure of the network.

The rapid use of the UPI platform for financial interaction has been highlighted in the first section of the research paper. The second section includes a literature review. The third section highlights research design including scope and method of research. It is followed by Data Analysis and Interpretation in the fourth section. At the end summary of findings, research contribution and conclusion are discussed.

Research-Design

This research uses a structured research methodology in the analysis of different aspects of UPI app usage, level of cybersecurity awareness, and response to fraudulent activities among 513 respondents. The methodology adopted comprised the following:

The reasons for restricting data collection to Ahmedabad and Gandhinagar are explained by the research objectives and feasibility factors.

The above data of population for the Ahmedabad and Gandhinagar cities is official and its base is the Census of India 2011 by January 2025. In terms of this census, while the people of Ahmedabad were 5,570, 585, the people of Gandhinagar were 206, 167. Population estimates for these cities have however been provided by different organizations after the 2021 population and housing census was delayed due to COVID -19 pandemic and is set to be conducted between 2024/2025. For example, by using Macrotrends, the population of the Ahmedabad metropolitan area for 2025 is considered to be around 9,062,000. On the same footing the Gandhinagar Municipal Corporation claims a population of 208,299 of Gandhinagar city. Since Ahmedabad is an urban centre with advanced economic activity, the people are diverse and actively use technology; thus, it is a good choice for studying UPI app usage and people's awareness as well as the reactions to scams related to it. The seasonally experienced climate of Gandhinagar supports the findings from the government and administrative perspective since it is a state capital. These cities also give combined perspective between Urban and Semi Urban population which helps in understanding penetration of digital payments.

- Data Collection: Data were collected through an online survey and spread among the respondents from Ahmedabad and Gandhinagar. The research design included high ethical considerations, stratified random sampling to ensure representative data from the two cities, and maintain privacy and confidentiality of the respondents (Singh, 2019).
- Questionnaire Design: The format of the questionnaire allowed the major areas to be embraced and included; personal and demographical info, payments preferences, UPI application usage, experience with fake profiles, knowledge on cybersecurity, and measures taken by the respondents (Raman, 2020). The employed form of data analysis design was the mixed-method design so that a collective approach for the assessment of the results could be conducted.



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- Data Analysis: Descriptive statistics were used to analyse quantitative data in the form of counts, percentages, and frequencies from which summaries were made (Field, 2018). Thematic analysis was conducted on the qualitative responses to the open-ended questions where common threads running in the respondents' answers were identified (Braun & Clarke, 2019). Cross-tabulations were done to look at the relationship between age and preference for UPI apps (Creswell & Creswell, 2017).
- Data Interpretation: The results were contingent upon interpreted data from the analysis of information and extracted key findings in the form of emerging themes and trends. Interpretation offered an in-depth review of the findings supported with percentages, counts, and summaries of main themes (Patton, 2015).
- Implications and Conclusions: Research findings were discussed in terms of implications relevant for providers, users, and policymakers of the UPI app (Kothari, 2004). Conclusions were drawn based on the analysis of the study for the summarized key takeaways with directions for future research (Kumar, 2019).

DATA ANALYSIS AND INTERPRETATION

Demographic Profile of Respondents

Table 1: Demographic Profile

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Demographic	Value
Respondents from Ahmedabad	72.66%
Respondents from Gandhinagar	26.56%
Unspecified Location	0.78%
Male Respondents	60.04%
Female Respondents	39.77%
Age Group 18-25	44.92%
Age Group 25-35	32.23%

Maximum respondents (72.66%) belong to Ahmedabad, and 26.56% of them come from Gandhinagar. Only a very tiny percentage (0.78%) mentioned nothing about their location (**Raman, 2020**). The gender ratio suggests that 60.04% are male and 39.77% are female (**Sharma, 2018**). About age groups, the largest segment of respondents (44.92%) is in the 18-25 age category, followed by the age group 25-35, which constitutes 32.23% of the sample (**Bansal, 2020**). Other age groups like 35-45, 45-55, and above 55 have been considered to constitute the minor part of the sample where the demographic segment of 18-25 represents the most substantial group in the study.

The changes in the percentage of the respondents are in concordance with the features of the target population. The comparatively higher proportion from Ahmedabad (72.66%) than that from Gandhinagar (26.56%) can be attributed to a higher population index and faith in the economy of Ahmedabad. This 0.78% of unspecified originating locations may be due to some sort of privacy issues or mere negligence. This disparity by gender with 60.04% of the respondents being male and 39.77% being female may be due to cultural HIV or differences in the level of participation in financial /technology related studies. This comes out clearly because the largest segment of the population using digital payments is the 18-25 category at 44.92% with the 25-35 category at 32.23% while the remaining segments comprise the rest in what can be viewed as having lower levels of digital payments acceptance.

Mode of Payment

Table 2: Mode of Payment

Payment Mode	Percentage of Transactions
UPI Apps	31.19%
Cash	22.61%
Mobile Banking	8.38%
Cash & UPI Combined	6.43%

While examining the preferences, UPI apps emerged as the most commonly used mode of payment, constituting 31.19% of the transactions (Sahoo et al., 2019). The next one is cash, which accounts for 22.61% of the transactions, while the third one is mobile banking at 8.38% of transactions (Bhasin, 2021). Both cash and UPI apps combined make up 6.43%, suggesting a trend toward a mix between digital and traditional modes of exchange (Rathore, 2016). On the other hand, smaller proportions of the sample use other payment modes, such as Internet banking and cheques, in their multitude of preferences when paying bills.

The analysis of payment preferences highlights the growing dominance of digital payment methods, with UPI apps leading as the most preferred mode of payment. This trend reflects the increasing acceptance and reliance on



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digital platforms for seamless and instant fund transfers. Cash, while traditionally dominant, remains relevant, particularly in informal or smaller-scale transactions. Mobile banking signifies a moderate yet noteworthy share, driven by users seeking convenience without fully transitioning to app-based payments. The combination of cash and UPI indicates a blending of traditional and digital payment habits, illustrating a transitional phase among consumers. Other modes like Internet banking and cheques, though used by smaller segments, showcase the variety of payment preferences, catering to different needs and levels of digital adoption. This distribution highlights the evolving payment landscape, with digital methods paving the way for a more technology-driven economy.

Frequency of Using UPI for Financial Transactions

Table 3: Frequency of UPI Usage

UPI App	Percentage of Users
Google Pay	28.46%
Paytm	8.77%
PhonePe	7.02%
Never Used UPI	12.87%

It was found that Google Pay is the most used UPI app, with 28.46% of the sample size; followed are PhonePe, 7.02%, and Paytm, 8.77%, respectively (Singh et al., 2020). A big share of 12.87% of people never used a UPI app for any financial transactions (Pathak, 2021). Only smaller percentages of respondents use other UPI apps, like BHIM or Amazon Pay, which shows different levels of market penetration of the different UPI apps.

Factors Influencing the Choice of UPI App

Table 4: Factors Influencing the Choice of UPI App

Feature	Percentage of Respondents
Security Features	38.01%
User Interface	23.20%
Customer Service	16.76%
Offers/Rewards	12.87%

Of the UPI apps, 38.01% of the respondents named security features as the most considered feature while choosing an app—the first most considered by a respondent (Luo et al., 2020). The second important feature that is considered is the user interface, which constituted 23.20% of the respondents, followed by customer service, at 16.76% (Price Water house Coopers, 2020). Offers and rewards also have some influence on the choice of the UPI app, as stated by 12.87% of people (Das & De, 2020). Other findings state that a small percentage of respondents either preferred not to answer or failed to provide a specific reason for their choice; ease of use and alternative payment methods were other reasons (Kothari, 2004).

Security and Assurance with the Use of UPI Apps to Perform Financial Transactions

Table 5: Security Perceptions

Feeling Towards UPI Security	Percentage of Respondents
Feel Secure and Confident	35.28%
Neutral	29.43%
Insecure	1.95%
Very Insecure	4.48%

The data related to perceptions towards security and confidence in using UPI apps shows that 35.28% feel secure and confident using the apps (Singh, 2019). However, as high as 29.43% of respondents felt a neutral feeling toward it without having strong feelings on the insecurity part associated with UPI (Raman, 2020). A lesser proportion of respondents (1.95%) expressed they are insecure and not confident, while 4.48% expressed a very insecure feeling (Bansal, 2020). The findings are suggestive of the fact that whereas a significant majority, in terms of numbers of users, find UPI apps trustworthy, there is a significant minority that holds concern about their security (Bhasin, 2021).

Identification and Management of Fraudulent Activities

Table 6: Fraudulent Activity Response

Response Time	Percentage of Respondents
Same Day or Within a Day	29.24%
Within a Week	14.04%
Never Detected/Resolved	18.32%
No Indication of Experience	24.56%



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The experiences among respondents in detecting and resolving fraudulent activities on their UPI app accounts differ largely. About 29.24% of them detected and resolved such activity on the same day or within a day, while 14.04% did so within a week. However, 18.32% of the respondents never detected or resolved any fraudulent activities, indicating that there might be gaps in user awareness and app security. A notable percentage of the respondents, 24.56%, failed to indicate their experience in fraud detection and resolution. This points to the various levels of engagement with security issues.

Preventive Measures Towards Further Fraudulent Activities

Table 7: Preventive Measures Against Fraud

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Percentage of Respondents	
34.57%	
14.84%	
8.98%	
4.30%	
24.61%	

In response to the fraud activity, 34.57% of the respondents reported that they either changed their UPI PIN or password beforehand as a preventive measure to prevent the fraudulent activity from occurring against them further after scamming. The second most common response was reporting to cyber police, and 14.84% of the respondents said so. Other respective measures include reporting in the bank (8.98%) and reporting in the UPI app company (8.40%) (Singh et al., 2020). A meagre 4.30% preferred to unlink their bank account from the UPI app, which is one of the ways a person may use to enhance account security (Raman, 2020). Importantly, 24.61% of the respondents did not take any specific action against fraud, which implies more awareness and education should be provided on how to be protected from fraud (Luo et al., 2020).

Be Aware of the Risk Involved in Opening Email Attachments and Clicking on Suspicious Links

Table 8: Cybersecurity Awareness

Awareness Level	Percentage of Respondents
Agree on Risks	40.55%
Strongly Agree	23.98%
Neutral	16.96%
Disagree	6.43%

Cybersecurity awareness information indicates that 40.55% of all respondents agree when it is said that they understand the risks of opening email attachments from unknown senders and clicking on questionable links (Rathore, 2016). However, for a big percentage of 23.98%, strongly agree, which is a high level of being informed (Sahoo, Das & Das, 2019). However, 16.96% of respondents remained neutral, and 6.43% disagreed, indicating that there is still scope for growing awareness of cybersecurity risks (PricewaterhouseCoopers, 2020).

SUMMARY OF FINDINGS

This research explores how UPI technology affects India's digital payment usage, competition and security. Participants from both cities are employed to include diverse samples from both urban and lightly urbanised populations, Although the participants were from the two different cities of India, but still it has concerned the students and young population who showed very high use of UPI apps. It revealed that Google Pay is the market leader in the payment sector, and there is evidence to believe that other UPI apps may be in danger of becoming e-moths. Although the majority of respondents reports a fairly high level of trust in UPI platforms, a significant number of them is still concerned with issues of security and fraud. The work stresses religious cybersecurity and suitable fraud identification since it found different scales of users' readiness and consciousness. A mixed-method approach of quantitative and qualitative research is used as it offers triangulation data on the current dynamic of the digital payment system. ecosystem.

RESEARCH CONTRIBUTION

This research provides value to the topic of digital payment systems by presenting region-wise analysis of UPI in India. It embraces demographic factors like generation for example generation 3 or 4 for payments going digital and key factors in UPI- Security, Trust and Convenience. These results support the arguments of previous works, namely, Venkatesh, Thong, and Xu (2012) and Luo et al. (2020) that proposed perceived ease of use and trust as factors influencing technology adoption and highlighted security perceptions as a factor affecting digital payments. Nevertheless, the conclusions also differ from the studies like Sahoo et al. (2019), who also emphasized that there is still considerable usage of cash for payments in certain population segments; and they state that digital shift does not occur in terms of geography or generation.



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The focus of the study on cybersecurity awareness and fraud prevention is in sync with PricewaterhouseCoopers (2020) work, which pointed at trust and security as the major determinative of the use of digital payment platforms. On the other hand, findings from Bansal (2020) established security concerns as key but noted that usability and rewards dominate the choice made by users in a complex balance. In this study, app owners are given recommendations on how they can enhance security functionalities and accessibility while policymakers are given overviews of how to proceed with awareness programs to fill existing voids in fraudulent activities and cybersecurity literacy. Using both quantitative and qualitative analysis, this study provides a solid starting point for further examination of technological developments and behavioural trends in financial technology.

CONCLUSION

The paper provides important insights into the adoption and usage of UPI apps, along with the security concerns and challenges faced by its users. The research found out that although popularly used, especially among the youth, there still exists significant security concern which needs to be addressed by the developers. These results suggest that UPI app providers, banks, and policymakers would need to better security features, improve customer awareness, and create more trust in the digital payment system. All such challenges need to be answered to ensure the survival of UPI apps in a dramatically changing environment of digital payments.

General Citizens Practical Implications:

Awareness of Cybersecurity: As previously mentioned, only 40.55% of respondents indicated their agreement regarding the danger of opening e-mail attachments and clicking suspicious links, while 23.98% strongly agreed. At the same time, 16.96% did not express their opinions. The remaining 18.52% either disagreed or strongly disagreed with the provided statements. It can be stated that while the country's citizens already have some awareness levels, there is much room for improvement.

Preventive Measures: Since 34.57% of respondents changed their UPI PIN/password, it can be assumed that preventive measures are crucial. However, 24.61% did nothing to prevent such occurrences, and 40.82% altered their passwords after an incident.

Suggestions:

Cybersecurity Practices: It is recommended from the findings that cybersecurity practices include changing one's passwords and enabling 2FA. It should also be avoided to click suspicious links or download attachments from unknown sources. Since 16.96% of citizens did not have relevant opinions and knowledge, they should participate in awareness programs and address the national legal code.

Reporting Fraud: Citizens should report fraud cases immediately to their banks and local cyber police. Reporting such cases is possible under the Information Technology Act, 2000.

Participation in Awareness Programs: Citizens should participate in events and other informational campaigns to become more aware of risky digital payment practices. Though only 23.98% of citizens indicate strong agreement, a significant portion remains neutral, which is unacceptable.

Cybercrime Officers Practical Implications:

Fraud Detection and Prevention: Given that 29.24% of respondents detected and solved fraud incidents on the same day and 18.32% could not identify them at all, a stronger focus on these aspects is required.

Collaboration with Financial Institutions: While 27.88% liaised with financial institutions about these situations, more emphasis is needed here.

Suggestions:

Training and Tools: Officers must participate in specialized training courses and investments in relevant tools and technologies.

Public Awareness Campaigns: Offer programs for citizens that will help them understand how to address the provisions of the law; for this purpose, Section 66D of the IT, 2000 is ideal.

Data Sharing and Collaboration: There is a necessity to exchange information between banks and police, and here, officers can be at the forefront. As such, 24.56% of respondents have never experienced these situations and must be included in relevant programs.

Banks Practical Implications:

Strengthening Security: Noting that 38.01% of respondents chose UPI applications based on security features, the remaining indicators are 35.28% feeling secure and 29.43% remaining neutral. Another 20.28% feel insecure using UPI applications.

Customer Support: While 8.98% reported his case to the bank only, another 14.84% did so via cyber police.

Suggestions:

Enhanced Security Features: It is necessary to introduce new security technologies and measures in order to track users who change platforms quickly.

Fraud Detection Systems: Create such systems that can detect fraud incidents quickly.

Customer Education: Develop programs for citizens on how to behave in such situations. Include information on the applicable law, as well as the customers' rights under the Banking Ombudsman Scheme, 2006.



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