

## Exploring the Impact of Digital Transformation on the Electronic Rupee (E-Rupee) by User's Intention and Behavior to Sustain the Business Ecosystem in India using the Technology Acceptance Model

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### ABSTRACT

*As a potential instrument to promote “financial inclusion” in the economy, central banking institutions in developing and emerging economies have acknowledged that they have considered the use of digital currency issued by a central bank. Using the Technology Acceptance Model, the study seeks to document and investigate the effects of digital currency adoption in India. To investigate and elucidate the ways in which consumers accept and utilize electronic rupee (e-rupee), a Technology Acceptance Model was developed. To investigate papers and publications about digital transformation to support India's business ecosystem, a thorough review of the literature was conducted. The results of the study showed that a number of variables, including technical ones such as variations in practitioners' understanding and proficiency with digital money, had an impact on adoption. The significance of the e-rupee is good for social behavior and economic progress. The greater use of digital technologies may encourage economic growth (Ha & Thanh, 2022). Therefore, the study comes to the conclusion that research should concentrate on the phenomena of users' purpose and acceptance to revolutionize and transform digital currency, in this case, the electronic rupee, as well as the effects of this transformation on business ecosystems in India using the Technology Acceptance Model.*

**Keywords:** Blockchain Applications and Digital Technology; Digital Money; Digital Cash Cryptocurrencies.

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### 1.0 Introduction

Technology has been rapidly growing recently, all sectors have implemented technology from business, education, and government.

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According to EY, India's strong services exports have grown by 14% over the last two decades and stood at US\$254.5b in 2021-2022. A large part of services exports is from Information Technology (IT) Services and Business Process Outsourcing (BPO) services with US\$157b in 2021-22. According to Forrester's 'Asia Pacific Tech Market Forecast, India's spending on software will continue its rapid growth over the next few years. It will be followed by spending on information technology (IT) services, communications equipment, and computers. In 2024, the country's tech spending growth is expected to reach US\$54.5 billion. The report predicts that the share of software purchases will climb from 26.4 percent in 2024 to 30 percent of total technology spending in 2027, outpacing the other IT categories due to demand.

India has persisted in advancing technology throughout numerous industries, including business, government, and education. India is the country whose central bank creates digital currency. Digital currency is a new form of techno-money in financial economics and a form of innovation in the financial sector. With assistance from the internet revolution and soft technology, the digital currency has steadily taken over as the financial, economic, and population growth (Armelius *et al.*, 2020). India uses the electronic rupee, which incorporates cryptocurrencies into transactions, in this context. Armelius, Claussen, and Hendry claimed that the national bank of the country directly regulates CBDC, which is backed by both national credit and government authority. Not many technocrats view CBDC as a digital facet of sovereign currency, with the central bank developing its financial policies (Armelius *et al.*, 2020). The goal of the study is to analyze user behavior and intentions using the Technology Acceptance Model (TAM). It also aims to analyze user intentions about maintaining user privacy data.

## 2.0 Literature Review

### 2.1 Introduction of E-Rupee

The introduction of cryptocurrencies into the electronic rupee is a financial industry breakthrough. From a financial standpoint, the digital rupee can support the nation's technical achievements, encourage a digital-first economy, expedite transactions through faster and more secure digital payment systems, and lessen reliance on hard money. The digital rupee can be used for a variety of purposes, such as paying utility bills, credit card payments, EMIs on current loans, vehicle loans, online shopping, and the acquisition of additional utility services. Since the bond will be issued on par with the Indian Rupee, it will always be easy to convert it back to the Indian Rupee (Aparanji, 2022).

From a technological standpoint, the electronic rupee is a cryptocurrency that supports payment integration, with the e-rupee being integrated into other national banking systems in India. In India, the electronic rupee promotes and advances digital payments and trade. The use of digital rupees for transactions like credit card purchases and home bill payments is already supported by the government. On the other hand, if there is a problem with the electronic rupee's implementation, it is that most Indians still prefer to transact with physical currency, as evidenced by government statistics indicating that during the fiscal year 2022, there was a 5% increase in the number of banknotes in circulation (ICICI Bank, 2023).

## **2.2 The significance of E-Rupee**

The significance of the e-rupee is good for social behavior and economic progress. The greater use of digital technologies may encourage economic growth (Ha & Thanh, 2022). It can accelerate money digitization and advance India's cashless economy. The adoption of the digital rupee will revolutionize payment techniques, particularly in the realm of cross-border transactions. Future use cases that are suited to certain market demands are probably going to arise as a result of the digital rupee's development (Kotak, 2023). The significance in the banking sector, digital money has the potential to lower transaction costs, speed up local and international transactions, and provide rural communities greater access to the financial system.

The goal of the study is to improve user intention and encourage more people to use electronic rupee (e-rupee) for payments to increase efficiency and effectiveness. It also aims to promote and encourage digital payment and commerce in India. The Technology Acceptance Model is used in the analysis. Savvas Papagiannidis (Business School, Newcastle University, UK) and Davit Marikyan (Business School, University of Bristol, UK) state that adopting and using information technologies can have both short- and long-term positive effects on individuals and organizations, including increased productivity, cost and time savings, and convenience. For a considerable time, IS management research has been driven by the potential benefits that technology can offer to investigate people's readiness to adopt new technologies. Its power comes from the digital rupee's social benefits. Additionally, it has the ability to improve India's social and economic conditions.

## **2.3 The difference between E-Rupee and UPI**

The difference between the electronic rupee (e-rupee) and UPI (PhonePe, PayTM, and other similar applications owned by India) (Table 1).

**Table 1: Different between the E-Rupee and UPI**

Electronic Rupee (E-Rupee)	UPI
Another form of currency like fiat currency that one can't take out of their bank account	Interface that allows users to make online transactions through their bank account. It uses fiat currency for making transactions.
The electronic rupee (e-rupee) is a digital currency	UPI is a platform for digital payments that has already been implemented
Electronic rupee (e-rupee) is to provide a digital alternative to cash and physical currency that is easier to use, secure, and accessible to a wider range of people. The digital rupee is expected to make transactions faster, cheaper, and more secure, thus making digital payments more accessible to people. Electronic rupee (e-rupee) in the digital wallet is equivalent to physical cash in a physical wallet. Once the customer loads a digital rupee in a digital wallet, it is treated as cash withdrawn from the bank account. Hence the customer can't earn interest on the amount.	UPI on the other hand is a payment platform that enables instant money transfer between two bank accounts through a mobile phone. UPI was launched by the National Payments Corporation of India (NPCI) in 2016 and has become a popular mode of payment in India. Since the amount is kept in a bank account, the customer can earn interest on the account balance.

### 3.0 Research Methodology

#### 3.1 Systematic literature review

A systematic review is a transparent process, and in contrast to narrative reviews, it adopts explicit procedures and depends on the clarity of reporting. It can also summarize the evidence in some practice areas, which interested actors (i.e., policymakers) can draw upon (Hamdan *et al.*, 2021). A systematic literature review is a set of methodologies in which a researcher systematically searches for and integrates knowledge generated through empirical studies to inform policy and decision-making (Maeda *et al.*, 2021). Initial database searches yielded 1,440,000 articles about digital currency including blockchain, cryptocurrency, the challenges, and the risks and we are screening and selecting 29,500 results that article discuss CBDC and the digital rupee which are essentials for deeper insights.

#### 3.2 Sentiment analysis

Sentiment analysis is a technique that categorizes opinions from pieces of text to determine a sentiment score (positive, negative, or neutral). Sentiment analysis is

dependent on machine learning- or lexicon-based approaches. It is a computational technique to identify and categorize emotions expressed in textual data. It leverages natural language processing (NLP), machine learning, and linguistic analysis to ascertain the sentiment conveyed by a text, whether positive, negative, or neutral.

The research is conducted to analyze people’s opinions about digital rupees and their sentiments toward it. The research is done by extracting data from X (a.k.a. Twitter) using the keywords ‘erupree’ and ‘digitalrupree’ by using a random sampling method, where the date ranges from 2022-02-01 to 2024-10-02. The research aimed to gather insights on the overall sentiments of the tweets: positive, neutral, and negative. 1,250 tweets were managed to be extracted, containing 15 attributes as follows (Table 2).

**Table 2: Extracted Tweet Attributes**

Column Names	Description
conversation_id_str	Conversation ID
created_at	Creation date
favorite_count	Count of favourite
full_text	Tweet text
id_str	ID (in string)
image_url	Image URL (if any)
in_reply_to_screen_name	Reply to (username)
lang	Language used
location	Author location
quote_count	Count of quote
reply_count	Count of reply
retweet_count	Count of retweet
tweet_url	Tweet URL
user_id_str	User ID
username	Username

The research was conducted by using both qualitative and quantitative methods. The quantitative approach was used to obtain information on the popularity of keywords and the general sentiment of the tweets on a particular topic, whereas the qualitative method involved analyzing the tweets and generating word clouds. The research workflow involved the following steps:

1. *Data extraction:* The extraction of data in this case tweets is done using Tweet Harvest, an automatic web browser scrapping tool based on Playwright. Managed to extract 1250 tweets.

2. *Data preprocessing*: The data preprocessing for tweets is based on NLP and involves several steps including:
  - Decoding and translating: The initial step of data preprocessing is decoding and translating the tweets that are written in other language than English e.g. Hindi, Gujarati, etc.
  - Cleaning: It includes the removal of duplicated records, and transforming create\_at attributes into proper datetime format. Username, hashtag, link, punctuation, and single-character removal are done in this step. Furthermore, it also performs the replacement of a new line with space.
  - Tokenizing: It splits a string of text into individual words or tokens for easier manipulation and analysis of the text data.
  - Stop word removal: It is the process of filtering out common words (like “the,” “is,” and “in”) from text data to focus on more meaningful words that contribute to the analysis.
  - Lemmatization: This final process reduces words to their base or root form, known as the “lemma,” by considering the context and morphological analysis.
3. *Data sentiment analysis*: VADER (Valence Aware Dictionary and Sentiment Reasoner) lexicon is used for sentiment analysis. It is a pre-built sentiment analysis tool specifically designed for social media text. The category is determined from the polarity score of string (Table 3).

**Table 3: Polarity Scores and Sentiment Categories**

Polarity Score	Sentiment Category
> 0	Positive
== 0	Neutral
< 0	Negative

4. *Data visualization*: A simple bar chart is used to compare the sentiment categories, it also contains the percentage of each category. Moreover, word clouds are used to know the overall opinion of people about digital rupees positively and negatively.

### 3.3 Technology Acceptance Model

The Technology Acceptance Model (TAM) is usually used in research on new technology, it is used to understand the new technology can be accepted, perceived, and used by others. According to Davit Marikyan (Business School, University of Bristol,

UK) & Savvas Papagiannidis (Business School, Newcastle University, UK), The acceptance and the use of information technologies can bring immediate and long-term benefits at organizational and individual levels, such as improved performance, financial and time efficiency and convenience (Marikyan & Papagiannidis, 2023). In the study context, the TAM is used to attract the user's intention to use new technology (in this context is electronic rupee) and understand the behavior (any change of user's behavior) to new technology (in this context is the electronic rupee).

The Technology Acceptance Model (TAM) is influenced by usefulness because the e-rupee is useful for easy transactions, simpler business transactions, and effectiveness of the transactions as well as promoting financial inclusion. According to TAM, technology acceptance is a three-stage process, whereby external factors (system design features) trigger cognitive responses (perceived ease of use and perceived usefulness), which, in turn, form an effective response (attitude toward using technology/intention), influencing use behavior. TAM represents the behavior, as the outcome predicted by perceived ease of use, perceived usefulness, and behavioral intention.

## **4.0 Results and Discussion**

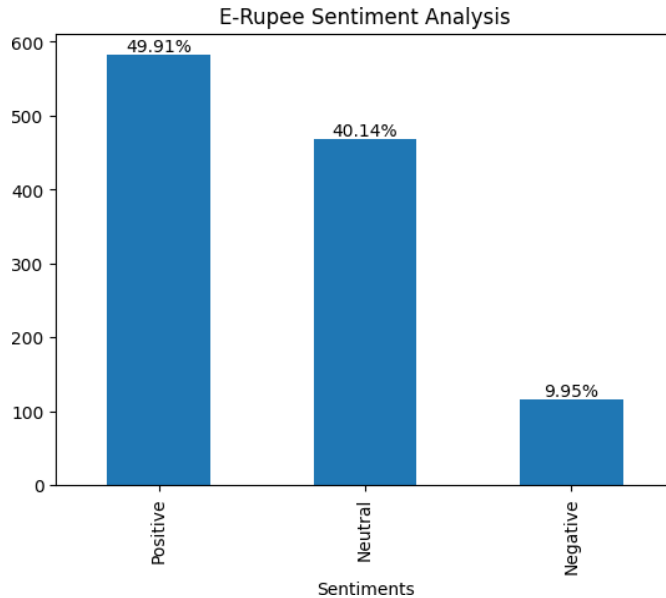
### **4.1 Sentiment analysis results**

As one of the most popular microblogging platforms, X formerly known as Twitter is chosen as the social media platform to conduct sentiment analysis. The digital rupee is a phenomenal topic for sentiment analysis that can use Twitter to effectively assess public opinion regarding e-rupees and adjust their policies and communications tactics accordingly.

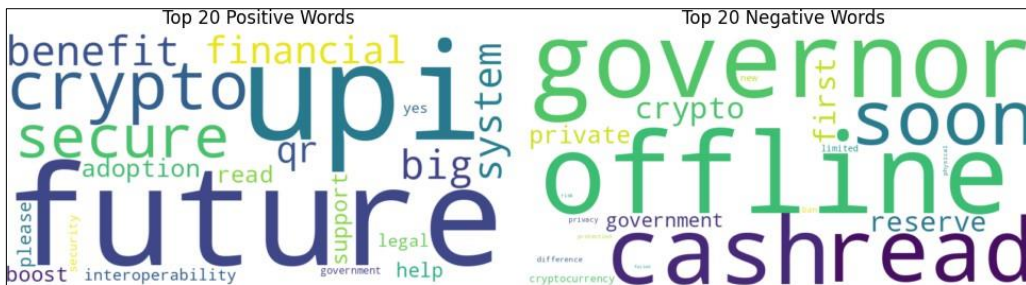
Using the random sampling method, 1,166 preprocessed tweets are obtained with each record containing 3 core attributes which are processed text, compound score, and sentiment category. The result of the research depicts 582 tweets classified as positive, 468 tweets classified as neutral, and 116 tweets classified as negative. The positive category held as the majority which represents 49.91% of the total records, followed by the neutral category with 40.14% of the total records. The negative category has the lowest percentage which is 9.95% of the total records (Figure 1).

Another analysis that is done in this research is the word cloud to represent the most common words for both positive category as well as negative category. The cloud words used are limited to get the top 20 common words only for each category (Figure 2). Some words appear in both categories such as 'read' and 'crypto'.

**Figure 1: E-Rupees Sentiment Analysis**



**Figure 2: Word Clouds Analysis**



This represents the duality of opinions in certain areas. Overall, the common positive words depict that the Indian people are ready for the transformation and believe that the implementation of digital rupees will be a big financial system that brings the future with a lot of benefits. On the other hand, minority parts of Indian people still prefer offline (cash) payment. They doubt the governor’s policy and crypto ecosystem. Moreover, they are also concerned regarding their privacy and believe that this transformation is too early.



## **4.2 The challenges of electronic rupee**

Technology may disruption and challenges, especially in digital currencies, including the e-rupee, are still relatively new and complex technology, and there may be regulatory challenges that need to be addressed for the e-rupee to be successful. India has not yet developed clear guidelines on the usage of digital currencies, and there have been recommendations to prohibit them outright. The challenges of the electronic rupee consist of digital illiteracy, scalability issues, privacy, and security concerns as well as competition from other payment options (Haque & Shoaib, 2023). Moreover, governance and policy are also a sensitive issue to be concerned.

- **Scalability issue**

India has a vast population and a digital economy that is expanding rapidly. One major challenge is scalability, as networks can struggle to process large volumes of transactions simultaneously. This issue can be addressed through technological advancements and network upgrades. The architecture must be scalable and capable of handling enormous amounts of transactions and user accounts. In this context, increasing the population in a country be a challenge to implement a new technology, it may be infrastructure to store large volumes of transactions.

- **Privacy and security concerns**

The RBI keeps a central record of every transaction. Authorities may use centralized data for additional purposes. India is a nation with a high incidence of cyber-attacks and a high level of cyber security risk. The introduction of digital currency may result in an increase in cyber attacks and the potential for digital theft. Therefore, the cyber security threats will always be the major concern. The design must include powerful security features, such as multifactor authentication, encryption, and real-time monitoring and alerting. In this context, the cryptocurrency should be equipped with proper security towards the electronic rupee (e-rupee) as a digital currency for transactions. In this study, cryptocurrency is equipped with public-private key encryption. This allows the electronic rupee (e-rupee) to be trustworthy and make transactions secure.

- **Competition from other payment options**

Nowadays, technology has rapid growth and many variations of digital payments. Many companies are offering digital payments such as Paytm, PhonePe, etc. that ease the transaction. It can be challenging for the digital rupee to compete with other digital payments that are available in India. Moreover, India is a price-sensitive market, and excessive transaction fees are likely to dissuade users. To encourage acceptance and usage, the architecture should offer cheap transaction fees. India has a large number of

unbanked and underbanked individuals, and incentive mechanisms could be utilized to promote the use of digital currencies. The architecture should include such methods as referral or transaction rewards.

- **Governance and policy**

It is critical that policymakers, financial institutions, and consumers are aware of these risks as they navigate the challenges of implementing a digital currency system.

### **4.3 The impact of implementation of electronic rupee**

The electronic rupee in India has to positive impact, especially on the economic and financial condition of India. The other positive impacts are increasing efficiency, promoting financial inclusion, improving security, and transparency in the payment system, aligning with the country's technological advancements, fostering a digital-first economy, reduce dependence on physical currency.

Regarding financial inclusion, China is a prime example of a nation that uses digital money similarly. The government implemented the digital yuan, which had an impact on the economy. The economy's response to the digital yuan is Due to the rapid development of multiple large-scale financial platforms that use financial technology (fintech) to lower the cost of providing financial services, the People's Republic of China (PRC) has quickly attained a relatively high degree of financial inclusion (access of individuals to financial products and services). The two most prominent are Tencent and Ant Group, which began in digital payments before expanding into other bank-like services including loans and investment products. The People's Bank of China (PBC) has been creating a central bank concurrently (Fullerton & Morgan, 2022).

The connection between the adoption of the digital yuan in China and the adoption electronic rupee is electronic rupee (e-rupee) also helps with financial inclusion, efficiency time, reduced human error during transactions, real-time transactions, simpler transactions, and simpler business processes. It is essentially identical to banknotes. The digital Rupee has the potential to bring significant benefits to the Indian economy and society by reducing the reliance on cash and modernizing the financial system. The following arguments support the notion that the digital Rupee is the currency of the future:

- **Financial Inclusion**

Avoid financial criminality for the sake of geopolitics, particularly when it comes to cross-border transactions. Since cryptocurrencies are created by private organizations and maintained by a large number of dispersed nodes that are compensated with block rewards for upholding the network, CBDCs are not genuinely

cryptocurrencies. Typically, a single central network supports CBDCs, and their sole purpose is to further the public policy of the sovereign state issuing them. Nonetheless, CBDCs want to borrow some of the security and simplicity of cryptocurrencies (Caudevilla, 2020).

- **Secure**

The digital rupee's security is crucial because it attempts to protect users' money and private data from fraud and cyberattacks. In contrast to decentralized cryptocurrencies, which because of their distributed structure are vulnerable to hacking and vulnerabilities, CBDCs are built with strong security features supported by central authorities. To guard against unwanted access and malicious activity, the digital rupee can be equipped with sophisticated encryption protocols, secure transaction authentication, and real-time monitoring systems. The digital rupee can increase user trust by providing a safe and secure transactional environment. This will promote adoption and usage while lowering the risks connected with digital financial systems.

- **Interoperability**

The ability of various digital currencies and financial systems to function together seamlessly is known as interoperability, and it makes cross-platform trades and transactions easier. By facilitating integration with current financial infrastructures, including conventional banking systems and other Central Bank Digital Currencies (CBDCs) worldwide, the digital Rupee seeks to improve interoperability. The efficiency of international trade can be increased by this interconnectedness, which can also simplify cross-border payments and lower transaction costs. The digital Rupee has the potential to become a major player in the developing field of digital finance by promoting greater financial inclusivity and improving user experience through the development of a cooperative ecosystem among different digital currencies.

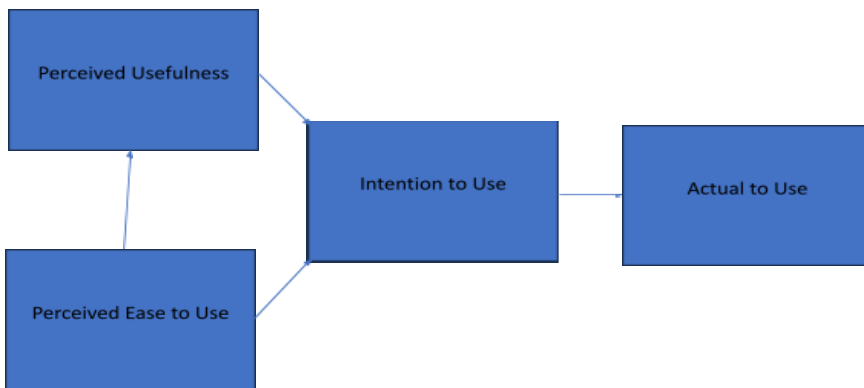
- **Reduce Human Error**

In many financial transactions, human error plays a major role and frequently results in expensive errors and inefficiencies. By using automated procedures and smart contracts that carry out transactions under preset criteria, the digital Rupee can reduce these kinds of mistakes. Through the utilization of technology, the digital Rupee can effectively manage transactions and lessen the dependence on human inputs, which are frequently prone to errors. Automated systems can also improve transaction speed and accuracy, guaranteeing efficient and accurate transfer of funds. This decrease in human error not only boosts user confidence but also makes the whole financial ecosystem more dependable and effective.

#### 4.4 Technology Acceptance Model

According to the Figure 3 of the Technology Acceptance Model (TAM), a user's attitude toward utilizing technology can be used to quantify their behavior propensity towards accepting technology, also known as their technology use behavior (Davis, 2023). Users perceived the ease of use of new technology. In this context, the user considers the ease of use of the rupee, such as the usage of electronic rupee ease to use or complicated to use, and then the user will perceive the usefulness of new technology.

**Figure 3: TAM Diagram**



Users will feel the experience when using the new technology. In this context, users will feel the experience of the electronic rupee when they are using the electronic rupee for the first time. Then, they will intend to continue to use the electronic rupee, it caused of the ease of transaction, efficiency of time when transaction, and effectiveness of the transaction.

**Table 4: The Factors Users Perceived the Ease of E-Rupee**

Factor	Explanation
Behaviour Use	The behavior of interest made by persons with great consideration to electronic rupee (e-rupee).
Behavioral Intention	A person intends to apply an effort to carry out the objective behavior.
Perceived of Use	A being's point of view is that utilizing the electronic rupee (e-rupee) will be effortless.
Perceived Usefulness	A being's point of view that utilizing electronic rupee (e-rupee) will efficiency and effective time

Then, they use the electronic rupee and any change of behavior after using the electronic rupee for a long time and the user will be comfortable and user not depend on physical cash it can efficiently time transactions, and is easy to use when transactions. The factors users perceived the ease of e-rupee, as shown in the Table 4.

## **5.0 Conclusion**

Sentiment analysis on X serves as a crucial tool for understanding public perceptions and attitudes toward emerging technologies, including the electronic rupee. By examining user sentiments expressed in tweets, this research can gain valuable insights into the overall reception of the digital currency, identifying both positive and negative perceptions. This analysis highlights key concerns and areas of enthusiasm among potential users, informing the subsequent stages of technology acceptance.

The connection between the Technology Acceptance Model (TAM) and the electronic rupee is a user's attitude toward utilizing technology can be used to quantify their behavior propensity towards accepting technology, also known as their technology use behavior (Davis, 2023). In this context, the TAM is influenced by usefulness, because the e-rupee is useful for easy transactions, simpler business transactions, and effectiveness of the transaction as well as promoting financial inclusion.

These insights feed directly into the Technology Acceptance Model (TAM), which outlines a three-stage process of technology acceptance. The findings from sentiment analysis act as external factors that trigger cognitive responses related to perceived ease of use and perceived usefulness. In turn, these cognitive evaluations shape users' attitudes toward adopting the electronic rupee, ultimately influencing their intention to use it. By integrating user sentiment into the TAM framework, stakeholders can enhance system design features that promote safe, efficient, and effective transaction practices, fostering a more inclusive financial ecosystem in India.

In the future, the digital rupee aims to enhance financial inclusion by addressing geopolitical financial criminality, particularly in cross-border transactions. Unlike cryptocurrencies, which operate on decentralized networks, Central Bank Digital Currencies (CBDCs) like the digital rupee are centrally governed to support public policy. While they borrow security features from cryptocurrencies, CBDCs offer a safer transactional environment through robust encryption, secure authentication, and real-time monitoring, essential for building user trust and promoting wider adoption.

Interoperability is another key advantage of the digital rupee, enabling seamless integration with existing financial infrastructures, including traditional banking and other

CBDCs. This interconnectedness can streamline cross-border payments and reduce transaction costs, making it pivotal in the evolving digital finance landscape. Additionally, by leveraging automated processes and smart contracts, the digital rupee minimizes human error in transactions, enhancing accuracy and efficiency. This reliable financial ecosystem boosts user confidence and contributes to a more inclusive financial environment.

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