International Journal of Humanities, Commerce and Education
Volume 2 | Issue 5 | May 2026 (Special Issue) | ISSN: 3108-0456 (Online)
Available online at: https://ijhce.com/
DOI: https://doi.org/10.59828/ijhce.v2i5.76

Central Bank Digital Currency in India: Implications of the e-Rupee for Banking Operations and Payment Systems

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Received: 17 April 2026 | **Accepted:** 02 May 2026 | **Published:** 15 May 2026

Abstract

The design of Central Bank Digital Currency (CBDC) represents a structural shift in the architecture of modern payment systems. In India, the Reserve Bank of India (RBI) launched the digital rupee (e-Rupee) with the objective of reducing transaction costs, enhancing payment efficiency and strengthening monetary transmission, and supporting financial inclusion. This paper examines the impact of the e-Rupee on the Indian banking system and payment ecosystem. Using a conceptual–analytical approach supported by secondary data, policy documents, and early pilot observations, the study evaluates implications for banks, payment intermediaries, consumers, and regulators. The paper finds that while the e-Rupee has the capability to improve payment security, settlement efficiency, and resilience, it also raises concerns regarding bank disintermediation, data privacy, and operational readiness. The study concludes that the success of the e-Rupee will depend on careful design choices, phased implementation, and coordination between the RBI, banks, and fintech firms.

Keywords: *Central Bank Digital Currency, e-Rupee, Digital Payments, Banking System, RBI, Financial Innovation*

1. Introduction

Digitalisation has fundamentally transformed the global financial system, particularly in the domain of payments. The rapid growth of digital payment platforms, cryptocurrencies, and private stable coins has compelled central banks worldwide to explore sovereign digital currencies. In this context, Central Bank Digital Currency (CBDC) has emerged as a credible public alternative to private digital money.

India has witnessed unprecedented growth in digital payments over the past decade, driven largely by the Unified Payments Interface (UPI), mobile banking, and fintech innovation. While these systems have enhanced convenience and access, they continue to rely on commercial bank money and intermediated settlement mechanisms. Recognising both the opportunities and risks posed by private digital currencies, the Reserve Bank of India introduced the e-Rupee as a digital form of sovereign currency.

The e-Rupee is designed to function as legal tender, carrying the same value as physical cash but in digital form. Unlike cryptocurrencies, it is centrally issued, regulated, and backed by the RBI. This paper seeks to analyse how the introduction of the e-Rupee may reshape the Indian banking system and payment landscape.

Recent academic literature has increasingly examined the economic and institutional implications of Central Bank Digital Currencies (CBDCs). Contemporary research suggests that CBDCs have the potential to enhance the efficiency, transparency, and resilience of digital payment systems while also strengthening financial inclusion. For example, **Agur, Ari, and Dell'Ariccia (2023)** highlight that CBDCs may reshape the structure of financial intermediation and influence the role of commercial banks within the monetary system. Similarly, **Kosse and Mattei (2023)** emphasise that the introduction of CBDCs can significantly improve payment system efficiency and reduce transaction frictions, particularly in economies experiencing rapid digitalisation. More recent analyses also suggest that CBDCs are likely to complement

existing digital payment infrastructures rather than completely replacing them (**Adrian & Mancini-Griffoli, 2024; Auer, Cornelli & Frost, 2024**). At the same time, researchers caution that issues relating to cybersecurity, data governance, and potential banking disintermediation must be carefully addressed for successful implementation. These emerging discussions underline the importance of examining CBDC initiatives within specific national contexts. In this regard, the introduction of the e-Rupee by the Reserve Bank of India represents a significant development in the country's digital financial architecture and warrants systematic examination of its implications for banking operations and payment systems.

2. Conceptual Framework: Understanding the e-Rupee

2.1 Meaning and Nature of CBDC

A Central Bank Digital Currency is a type of digital representation of one's country sovereign currency issued by the central bank. It is a direct liability of the central bank & can be used for payments, savings, and settlements.

2.2 Types of e-Rupee

The RBI has conceptualised two forms of e-Rupee:

- **e-Rupee (Wholesale):** Intended for interbank settlements and financial institutions.
- **e-Rupee (Retail):** Designed for use by the general public for every-day transactions.

2.3 Key Features of the e-Rupee

- Legal tender status
- Sovereign guarantee by RBI
- Digital and cash-like nature
- Interoperability with existing payment systems
- High level of security and traceability

2.4 Conceptual Framework: CBDC and the Financial System

The introduction of Central Bank Digital Currency represents an important institutional innovation within the monetary and financial system. From a theoretical perspective, CBDC can be understood as a digital form of sovereign currency that combines the credibility of central bank money with the efficiency of modern digital payment technologies. Unlike traditional bank deposits, which represent liabilities of commercial banks, CBDC constitutes a direct liability of the central bank, thereby altering the structure of financial intermediation.

The conceptual framework of this study is based on the interaction between three major components of the financial system: the central bank, the banking sector, and the digital payment ecosystem. The introduction of the e-Rupee has the potential to influence each of these components in different ways.

First, CBDC may improve the efficiency and resilience of payment systems by enabling faster and more secure digital transactions. Since CBDC transactions can occur without multiple intermediaries, settlement risks and transaction costs may be reduced. This can enhance the overall efficiency of the digital payment infrastructure.

Second, the availability of a digital form of central bank money may affect the role of commercial banks in financial intermediation. If individuals prefer holding digital currency issued by the central bank instead of traditional bank deposits, banks may experience changes in their deposit base. This phenomenon, often referred to as bank disintermediation, may influence lending behaviour and liquidity management within the banking system.

Third, CBDCs may also contribute to greater financial inclusion by enabling access to digital payment services for individuals who may not have access to traditional banking services. Features such as simplified digital wallets and potential offline transaction capabilities can expand the reach of formal financial systems.

At the same time, the introduction of CBDC raises several institutional and technological challenges, including issues related to cybersecurity, data privacy, regulatory governance, and technological readiness of financial institutions. The overall impact of the e-Rupee therefore depends on the interaction between technological design, regulatory oversight, banking sector adaptation, and user adoption.

Based on this conceptual understanding, the present study examines how the introduction of the e-Rupee may influence banking operations, payment system efficiency, and stakeholder perceptions within the Indian financial ecosystem.

3. Review of Literature

The notion of Central Bank Digital Currency has attracted growing academic as well as policy attention across the world. Several studies have examined its impact on monetary policy, banking stability & payment systems.

Kumhof & Noone (2018) argue that CBDCs can significantly improve payment efficiency while also strengthening the diffusion of monetary policy by providing a channel among the central bank and the public. Their analysis highlights the potential of CBDCs to reduce reliance on private payment intermediaries.

BIS (2020) emphasises that CBDCs should be designed carefully to balance innovation with financial stability. The study notes that poorly designed CBDCs could turn to bank disintermediation, especially during time of financial stress.

Auer & Böhme (2021) examine the technological foundations of CBDCs and suggest that interoperability within existing payment systems is very important for large-scale adoption. They stress that CBDCs should supplement than replace current digital payment infrastructures.

Gorton and Zhang (2022) analyse the role of CBDCs in enhancing trust in digital payments. Their findings indicate that sovereign backing increases public confidence compared to private digital currencies and stablecoins.

Prasad (2021) discusses the macroeconomic implications of digital currencies and argues that CBDCs can strengthen financial inclusion if supported by digital literacy and adequate infrastructure.

RBI (2022) outlines the objectives and design considerations of the e-Rupee, highlighting efficiency, safety, and accessibility as key goals. The report also acknowledges challenges related to privacy and cybersecurity.

Seth and Ghosh (2023) focus on India's digital payment evolution and argue that the e-Rupee represents a natural progression rather than a disruption of systems like UPI.

Allen et al. (2020) study CBDCs in emerging economies and find that they can reduce transaction costs and improve access to formal financial services.

Carstens (2021) highlights that CBDCs should reshape the role of commercial banks, requiring them to innovate and focus on customer-centric services.

Overall, the literature suggests that while CBDCs offer substantial benefits but their success depends on cautious implementation, regulatory clarity, technological robustness.

4. Objectives of the Study

The rapid emergence of Central Bank Digital Currency (CBDC) initiatives across the world has created significant interest among policymakers, financial institutions, and researchers. In India, the introduction of the e-Rupee by the Reserve Bank of India represents an important step towards strengthening the country's digital payment infrastructure and modernising the monetary system. However, the adoption of a sovereign digital currency also raises important questions regarding its implications for banking operations, financial intermediation, and payment system efficiency. In this context, the present study seeks to examine the potential impact of the e-Rupee on the Indian banking system and the broader digital payment ecosystem through the following specific objectives:

1. To examine the conceptual foundations and operational design of the RBI's e-Rupee.
2. To analyse the potential implications of the e-Rupee for the Indian banking system, particularly with respect to banking operations and financial intermediation.
3. To evaluate the role of the e-Rupee in shaping the future development of India's digital payment ecosystem.
4. To identify the major challenges and risks associated with the adoption of central bank digital currency in India.
5. To suggest policy measures that may support the effective and secure implementation of the e-Rupee.

5. Research Methodology

5.1 Research Design

The study adopts a **descriptive and analytical research design** to examine the implications of the e-Rupee for banking operations and payment systems in India. A descriptive approach is appropriate because the e-Rupee represents a relatively recent financial innovation and requires systematic documentation of its institutional features, objectives, and operational framework. The analytical component of the study allows for interpretation of stakeholder perceptions and evaluation of

the broader economic and operational implications of the digital currency. This combined approach enables the study to integrate conceptual understanding with empirical insights derived from stakeholder responses.

5.2 Sources of Data

The study utilises both **secondary and primary sources of data**. Secondary data were collected from official publications of the Reserve Bank of India, reports of the Bank for International Settlements, policy documents, academic journal articles, and publications from recognised financial institutions. These sources provided insights into the design features, objectives, and global developments relating to Central Bank Digital Currencies.

To complement the secondary analysis, a **perception-based primary survey** was conducted to capture stakeholder views regarding the potential impact of the e-Rupee. A structured questionnaire was designed to examine respondents 'awareness of the e-Rupee, their perceptions of its potential benefits, and concerns related to its adoption.

5.3 Sample Design

The study employed a **convenience sampling technique** to collect responses from individuals who are actively engaged with digital financial services. A total of **120 respondents** participated in the survey. The sample included three key categories of participants: bank employees, finance students and academicians, and active users of digital payment platforms. These groups were selected because of their familiarity with digital financial systems and their ability to provide informed perceptions regarding the potential implications of the e-Rupee.

5.4 Tools and Techniques of Analysis

The collected data were analysed using basic statistical techniques to interpret the perception of respondents regarding the e-Rupee. Percentage analysis was used to examine the distribution of responses across different categories, while weighted mean scores were calculated to evaluate overall respondent attitudes toward key aspects of the digital currency. Tabular and graphical presentations were used to enhance clarity and facilitate interpretation of the findings.

5.5 Limitations of the Study

Despite providing useful insights, the study has certain limitations. First, the analysis is partly based on perception-based responses because the e-Rupee is still in the pilot phase and large-scale empirical data are not yet available. Second, the sample size is limited and based on convenience sampling, which may restrict the generalisability of the findings. Third, the long-term impact of the e-Rupee may evolve as regulatory frameworks, technological infrastructure, and public adoption levels continue to develop.

6. Data Analysis and Interpretation

Table 1: Awareness Level about e-Rupee

Awareness Level	No. of Respondents	Percentage (%)
High	58	48.3
Moderate	42	35.0
Low	20	16.7
Total	**120**	**100**

Interpretation: The results indicate that awareness regarding the e-Rupee is relatively high among respondents. Nearly half of the participants (48.3 percent) reported a high level of awareness, while 35 percent indicated moderate awareness. Only a small proportion of respondents (16.7 percent) reported low awareness of the digital currency initiative. This finding suggests that the concept of the e-Rupee has already gained significant visibility among individuals who are engaged with digital financial services. The growing awareness may be attributed to increasing discussions surrounding digital payments,

the expansion of fintech platforms, and policy initiatives undertaken by the Reserve Bank of India to promote digital financial infrastructure. Higher awareness levels are important for the successful adoption of CBDC, as user familiarity and trust play a crucial role in the acceptance of new financial technologies.

Table 2: Perceived Impact of e-Rupee on Banking Efficiency

Impact Level	Respondents	Percentage (%)
High	50	41.7
Moderate	46	38.3
Low	24	20.0
Total	**120**	**100**

Interpretation: The findings indicate that a large majority of respondents perceive the e-Rupee as having a positive impact on banking efficiency. Approximately 41.7 percent of respondents believe that the digital currency will significantly improve banking efficiency, while 38.3 percent expect a moderate level of improvement. Only 20 percent of respondents expressed scepticism regarding its impact. These responses suggest that stakeholders expect the e-Rupee to streamline banking operations by enabling faster settlement processes, reducing reliance on multiple payment intermediaries, and lowering transaction costs. The adoption of digital sovereign currency may also facilitate more efficient liquidity management and enhance the overall speed of financial transactions within the banking system.

Table 3: Effect of e- Rupee on Existing Digital Payment Systems

Opinion	Respondents	Percentage (%)
Will complement existing systems	66	55.0
Will compete with UPI and wallets	32	26.7
Will replace some existing systems	14	11.6
No significant impact	8	6.7
Total	**120**	**100**

Interpretation: The responses indicate that the majority of participants (55 percent) believe that the e-Rupee will complement existing digital payment systems rather than replace them. This perception suggests that stakeholders view the digital currency as an additional payment instrument within the broader digital financial ecosystem. Around 26.7 percent of respondents believe that the e-Rupee may compete with existing payment platforms such as mobile wallets and digital payment applications, while only a small proportion expect it to replace certain systems. These findings highlight the possibility that the e-Rupee may coexist with existing platforms such as UPI and digital wallets, thereby strengthening the diversity and resilience of India's digital payment infrastructure.

Table 4: Major Challenges Associated with e-Rupee Adoption

Challenge Identified	Respondents	Percentage (%)
Cybersecurity risks	38	31.7
Data privacy concerns	34	28.3
Low public awareness	30	25.0
Banking system disruption	18	15.0
Total	**120**	**100**

Interpretation: The results reveal that cybersecurity risks and data privacy concerns are perceived as the most significant challenges associated with the adoption of the e-Rupee. Approximately 31.7 percent of respondents identified cybersecurity as the primary concern, reflecting the growing importance of digital security in financial systems. Data privacy concerns were reported by 28.3 percent of respondents, indicating apprehension regarding the protection and potential misuse of financial transaction data. Additionally, 25 percent of respondents pointed to low public awareness as a potential barrier to adoption. These findings highlight the need for robust cybersecurity frameworks, transparent data governance mechanisms, and effective public awareness initiatives to ensure the safe and widespread adoption of CBDC in India.

Table 5: Overall Perception Score of e-Rupee (Weighted Mean Analysis)

Statement	Weighted Mean Score
Enhances payment efficiency	4.12
Improves financial inclusion	3.98
Strengthens trust in digital payments	4.05
May affect bank deposits negatively	3.21

(Scale 1 denotes Strongly Disagree, Scale 5 denotes Strongly Agree)

Interpretation: The weighted mean analysis provides further insights into respondents 'overall perceptions of the e-Rupee. The highest mean score (4.12) was recorded for the statement that the e-Rupee enhances payment efficiency, indicating strong agreement among respondents regarding its potential to improve transaction speed and operational efficiency. Similarly, respondents expressed positive perceptions regarding the role of the e-Rupee in strengthening trust in digital payments (mean score 4.05) and promoting financial inclusion (mean score 3.98). However, the relatively lower mean score for the statement that the e-Rupee may negatively affect bank deposits (3.21) suggests moderate concern about the possibility of deposit migration from commercial banks to digital currency holdings. Overall, the findings indicate a generally favourable perception of the e-Rupee, while also highlighting certain areas of caution related to banking sector implications.

Graphical Presentation (Description)

Figure 1: Bar chart showing awareness levels of e-Rupee

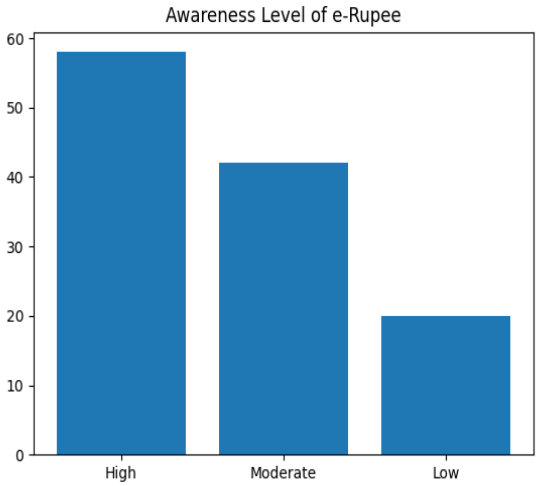


Figure 2: Pie chart depicting perceived impact on banking efficiency

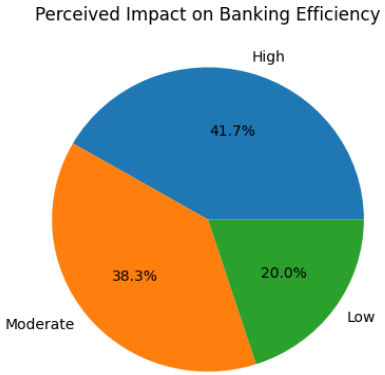
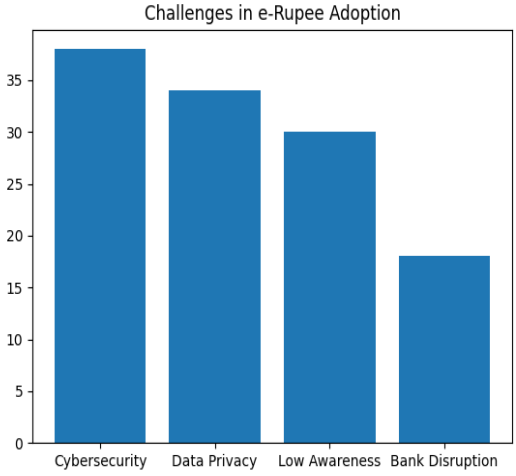


Figure 3: Bar chart highlighting key challenges in e-Rupee adoption



These charts visually reinforce the tabular findings and enhance interpretability of the results.

7. Impact of e-Rupee on the Banking System

7.1 Disintermediation Risk

One of the primary concerns for banks is the possibility of deposit moving from bank accounts to e-Rupee wallets. If individuals prefer holding digital currency issued by the central bank ie RBI, commercial banks may face reduced deposit bases, potentially affecting their lending capacity.

7.2 Changes in Bank Business Models

The e-Rupee may compel banks to rethink their role from deposit-centric institutions to service-oriented financial intermediaries. Banks are likely to divert attention to value added services, credit service delivery & advisory functions.

7.3 Impact on Monetary Transmission

As a direct liability of the RBI, the e-Rupee could improve the performance of monetary policy transmission. Rates of interest changes and liquidity measures may be transmitted more effectively through programmable or targeted digital currency mechanisms in the future.

7.4 Operational and Technological Readiness

Banks will be required to invest significantly in digital infrastructure, cybersecurity, and staff training to support e-Rupee transactions. Smaller banks may face higher adjustment costs compared to large commercial banks.

8. Impact of e-Rupee on the Payment Ecosystem

8.1 Payment Efficiency and Cost Reduction

The e-Rupee enables real-time, peer to peer transaction without multiple intermediaries, potentially reducing transaction costs and settlement time.

8.2 Financial Inclusion

By enabling offline transactions and simplified digital wallets, the e-Rupee can promote financial access, majority in remote and underserved areas where inclusion to banking services is limited.

8.3 Competition with Existing Payment Systems

The e-Rupee may coexist with systems like UPI, cards, and mobile wallets. While it may not replace these platforms, it could introduce healthy competition, leading to improved efficiency and innovation.

8.4 Security and Trust

Being a sovereign-backed instrument, the e-Rupee carries higher trust compared to private digital currencies. Enhanced security features can reduce fraud and counterfeiting risks.

9. Challenges and Concerns

9.1 Data Privacy and Surveillance

The traceability of digital currency transactions raises concerns about user privacy and potential misuse of data.

9.2 Cybersecurity Risks

As a fully digital instrument, the e-Rupee is exposed to cyber threats, requiring robust risk management frameworks.

9.3 Public Adoption and Awareness

The effectiveness of the e-Rupee relies on user acceptance, digital literacy, and trust in the system.

9.4 Regulatory and Legal Issues

Clear legal frameworks are required to address issues related to liability, dispute resolution, and cross-border usage.

10. Policy Suggestions

- Adoption of a phased and cautious implementation strategy.
- Ensuring interoperability with existing payment systems.
- Strong data protection and privacy safeguards.
- Capacity building for banks and financial institutions.
- Public awareness campaigns to encourage informed adoption.

11. Conclusion

The introduction of the e-Rupee by the Reserve Bank of India represents a significant milestone in the evolution of the country's monetary and payment systems. As digital financial technologies continue to reshape global financial architecture, central bank digital currencies are increasingly viewed as an important instrument for enhancing the efficiency, security, and inclusiveness of payment systems. The findings of this study suggest that the e-Rupee has considerable potential to improve payment efficiency, strengthen trust in digital transactions, and support the continued expansion of India's digital financial ecosystem.

The study also highlights that the adoption of the e-Rupee may have important implications for the banking sector. While the digital currency may improve transaction efficiency and reduce settlement costs, it may also require banks to adapt their operational strategies, technological infrastructure, and service models. Concerns relating to deposit disintermediation, cybersecurity preparedness, and data privacy governance therefore remain important considerations for policymakers and financial institutions.

From a theoretical perspective, this study contributes to the growing body of literature on central bank digital currencies by examining how the introduction of a sovereign digital currency may influence banking operations and payment system dynamics within a rapidly digitising emerging economy. By integrating conceptual analysis with perception-based empirical evidence, the study provides insights into the evolving relationship between central bank digital money, commercial banking institutions, and digital payment platforms.

The findings of the study also offer important policy and managerial implications. Policymakers should adopt a cautious and phased implementation strategy to ensure that the introduction of the e-Rupee does not disrupt financial stability or banking sector liquidity. Strengthening cybersecurity infrastructure, developing robust data protection frameworks, and enhancing digital literacy among users will be essential for building public trust and encouraging wider adoption of the digital currency. Banks and financial institutions will also need to invest in technological capabilities and innovation to effectively integrate CBDC-related services into their operational frameworks.

Despite these contributions, the study is subject to certain limitations. The analysis is partly based on perception-based responses and secondary information because the e-Rupee is still in its early stage of implementation. Additionally, the sample size used for the survey is relatively limited, which may restrict the generalisability of the findings.

Future research may examine the long-term impact of the e-Rupee using larger datasets and empirical transaction-level data once wider adoption occurs. Further studies may also explore the behavioural aspects of digital currency adoption, comparative international experiences of CBDC implementation, and the potential macroeconomic implications of sovereign digital currencies for monetary policy and financial stability.

Overall, the successful implementation of the e-Rupee will depend on effective coordination among the Reserve Bank of India, commercial banks, fintech institutions, and users. With appropriate regulatory oversight and technological preparedness, the e-Rupee has the potential to play a transformative role in strengthening India's digital financial ecosystem.

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Cite this Article:

Sharma, A. (2026). Central Bank Digital Currency in India: Implications of the e-Rupee for Banking Operations and Payment Systems. International Journal of Humanities, Commerce and Education, 2(5), 125–134.

Journal URL: *https://ijhce.com/* ***DOI:*** *https://doi.org/10.59828/ijhce.v2i5.76*