WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

e-Rupee and the Future of Payments in India

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ABSTRACT:

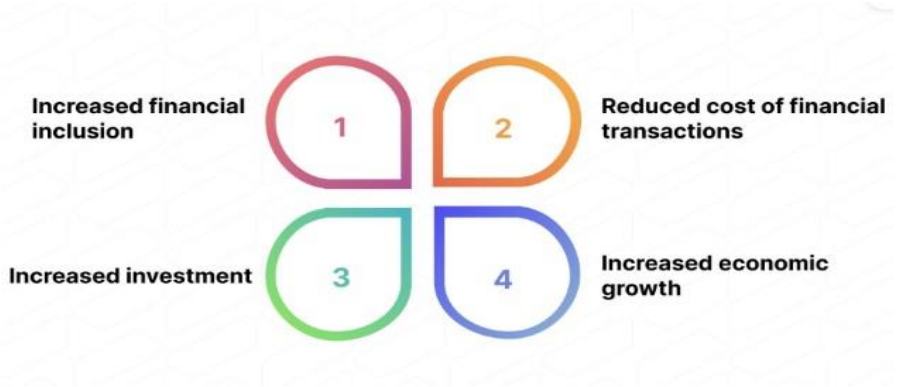
The emergence of Digital Rupee (e-Rupee), launched by the Reserve Bank of India (RBI), marks a transformative step in India's financial ecosystem. Positioned as a Central Bank Digital Currency (CBDC), e-Rupee aims to provide a secure, efficient, and direct medium of digital payment, minimizing the reliance on physical cash. Unlike UPI which requires third-party apps and intermediaries, e-Rupee enables direct transactions between bank wallets, with minimal delay and reduced failure risks. This study explores the functional aspects, unique features, potential challenges, and economic impact of e-Rupee in comparison to existing digital payment systems like UPI. Further, it examines the early-stage implementation across Indian cities, evaluates the usability in offline settings, and investigates how e-Rupee can strengthen rural digital finance. The research also analyses user experience, security mechanisms, and government strategies toward future international applications of e-Rupee. The findings underscore the importance of digital literacy, infrastructure, and policy support to enhance the adoption of this pioneering initiative.

Keywords: Digital Rupee, e₹, RBI, CBDC, UPI, Cashless Economy, Digital Wallet, FinTech

Introduction

India has witnessed a remarkable digital transformation over the past decade, especially in the area of financial services. A significant milestone in this journey was the introduction of the Unified Payments Interface (UPI), which revolutionized the way people transfer money by enabling fast, real-time payments through mobile apps. UPI empowered millions of users to adopt digital payments for daily transactions, from shopping and bill payments to peer-to-peer transfers.Building on this success, the Reserve Bank of India (RBI) has taken a further leap forward by launching the Digital Rupee (e-Rupee or e₹) — India's own Central Bank Digital Currency (CBDC). Unlike UPI, which depends on third-party platforms like Google Pay, PhonePe, and banks' apps, the e-Rupee is a sovereign digital currency directly issued and regulated by the RBI. It is designed to work as the digital equivalent of cash.

The e-Rupee enables secure and instant transactions using digital wallets, QR codes, and even offline functionality in areas with limited internet access. This is particularly important in rural and remote parts of India, where digital infrastructure may be weak. With the e-Rupee, users can make payments without needing internet connectivity, ATMs, or physical cash. This makes it a powerful tool for achieving financial inclusion, as it bridges the gap between the formal banking system and unbanked or underbanked populations.One of the key advantages of the e-Rupee is that it removes the need for intermediaries. Transactions occur directly between the RBI-backed digital wallet and the user or merchant, reducing delays, costs, and technical failures common with third-party systems. This peer-to-peer architecture also enhances security, ensures data privacy, and simplifies the process of receiving or sending money.



Moreover, the visual representation of currency denominations in the digital wallet (such as ₹100 or ₹500) gives users the feel of handling real money. This makes the transition from cash to digital smoother and more relatable, especially for those unfamiliar with digital finance.In essence, the e-Rupee is more than just a digital payment method — it represents a significant policy and technological shift toward a cashless, inclusive, and resilient digital economy. Its implementation could reshape India's financial landscape by offering a robust, secure, and scalable digital currency system for all

Review of literature:

Jani, S. (2018): This study explored the implications of rapid advancements in information and communication technologies, which have enabled the growth of digital currencies such as Bitcoin. The paper focused on the use of crypto currencies in peer-to-peer networks, online platforms, and gaming environments. It investigated consumer expectations from digital currencies and analyzed systemic trust in Bitcoin. The research also reviewed the regulatory responses of 21 countries, including implications for Indian law. **Sapovadia, V. (2018):**This research emphasized the importance of financial inclusion and the role of mobile technology and digital currencies in reaching underserved populations. It highlighted that a significant portion of the global population lacks access to formal financial services. The study identified mobile-based financial solutions as a way to lower transaction costs and expands access, especially in developing countries where traditional banking systems are limited.**Yanagawa & Yamaoka (2019):** Focusing on Japan, this paper examined the impact of CBDCs on payment systems and data usage. It highlighted the need to balance innovation in digital payments with data privacy and system security. The study stressed the importance of competition and interoperability among private payment service providers and discussed the potential challenges posed by CBDCs to existing financial intermediaries.

Kumar, A. (2021): This study addressed the ongoing shift from paper-based to electronic money. It emphasized the importance of government-backed digital currencies like CBDCs in restoring public trust in financial systems, particularly in light of the rise of private cryptocurrencies such as Bitcoin. The paper examined weaknesses in the current monetary system and suggested that CBDCs can address those through central bank oversight and stability. **Pavoor & Ajithkumar (2022):** Their paper highlighted the growing global trend of launching CBDCs and emphasized India's readiness to introduce the e-Rupee. It discussed how CBDCs differ from private crypto currencies and analyzed their potential impact on India's financial ecosystem. The study also presented global comparisons and raised important considerations about the legal and economic implications of CBDC adoption.**Farooqui, S. A. (2022):**This research analyzed the explosive growth in digital currencies since 2009, focusing on factors such as speculation, regulation, and illicit activities. The paper assessed the role of central banks in restoring order through CBDCs and discussed their influence on consumer spending, payment system integrity, and data governance. The study provided insights into macroeconomic and microeconomic implications of CBDCs.**Chen, Goel, Qiu & Shim (2022):**Based on a BIS survey of 26 central banks, this study analyzed motivations behind the development of retail CBDCs. It discussed key concerns like data privacy, operational frameworks, cross-border payments, and security. Countries like China, UAE, and Thailand were highlighted for their advanced pilot programs, while others showed cautious interest. The paper also outlined design strategies for balancing innovation with central bank policy objectives.

Kshetri, N. (2023): The study evaluated China's digital yuan, particularly its potential to expand financial access and the possibility of its use for economic surveillance by the Chinese Communist Party. The paper explored the global implications of the digital yuan and how it may influence the setting of international standards for government-issued digital currencies.**RBI (2021):**The Reserve Bank of India released a concept note on CBDC, outlining objectives, definitions, implementation strategies, and pilot frameworks. The note served as the foundation for India's formal approach to launching the e-Rupee.**Ghosh, A. (2021)**:This paper addressed regulatory concerns around CBDCs and emphasized India's cautious and research-based approach. It highlighted legal and technological readiness as critical factors for the success of a CBDC in India.**IMF (2022):**The International Monetary Fund published a global framework on CBDC development, analyzing case studies, risks, and benefits. The report served as a reference for both developed and developing nations interested in implementing CBDCs.**Kumar & Sharma (2022):**The authors compared the technological architecture and features of UPI, digital wallets, and e-Rupee. Their study focused on the operational efficiency and limitations of each system and how CBDC could complement existing digital infrastructure in India. **Economic Times (2023):**This article presented a comparative analysis of e-Rupee and UPI, explaining how CBDCs could offer faster settlement times, greater transparency, and reduced operational costs due to the elimination of intermediaries.**Joshi, R. (2024):**A pilot study conducted in Bengaluru revealed high acceptance of e-Rupee among the urban youth. The study provided empirical data on usability, ease of access, and user satisfaction in early-stage implementation.**ICICI Research (2024):**This report analyzed the security architecture of CBDCs and their advantages over private wallets. It concluded that CBDCs offer higher trust, lower fraud risk, and stronger regulatory oversight.**RBI Annual Report (2025):**The Reserve Bank of India provided comprehensive data on the first year of the e-Rupee pilot. It included statistics on transaction volume, adoption rates, user feedback, and technical challenges..

Objectives of the study:

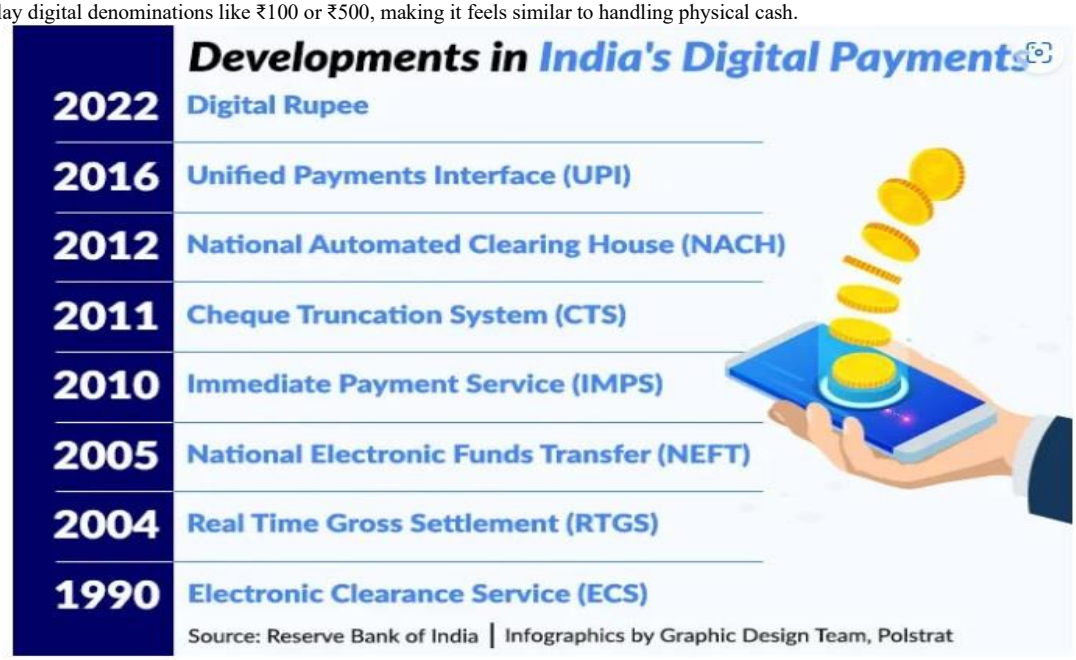
1. To analyze the working and structure of the e-Rupee system introduced by RBI.
2. To compare the benefits and challenges of e-Rupee with other digital platforms like UPI.
3. To study the impact and future potential of e-Rupee in India's financial inclusion and digital economy.

1.Working and structure of the e-Rupee system

The primary objective of this study is to understand the technical structure, operational framework, and practical functionality of the e-Rupee, India's Central Bank Digital Currency (CBDC), introduced by the Reserve Bank of India (RBI). As digital payments continue to dominate India's economy, the RBI's e-Rupee initiative represents a paradigm shift in how money is created, distributed, and used.The e-Rupee, or Digital Rupee, is a digital form

of sovereign currency issued and backed by the RBI. It is designed to serve as a legal tender, similar in value to physical cash, but available in a digitally stored format through a mobile or web-based application. It is centrally controlled and regulated by the RBI and is intended to function as a risk-free, government-guaranteed medium of exchange, just like physical currency.The RBI has launched the e-Rupee in two forms:Retail CBDC (e₹-R) – For individuals and businesses, to be used in everyday transactions.Wholesale CBDC (e₹-W) – For interbank transfers and settlements, aimed at improving efficiency in the financial system.

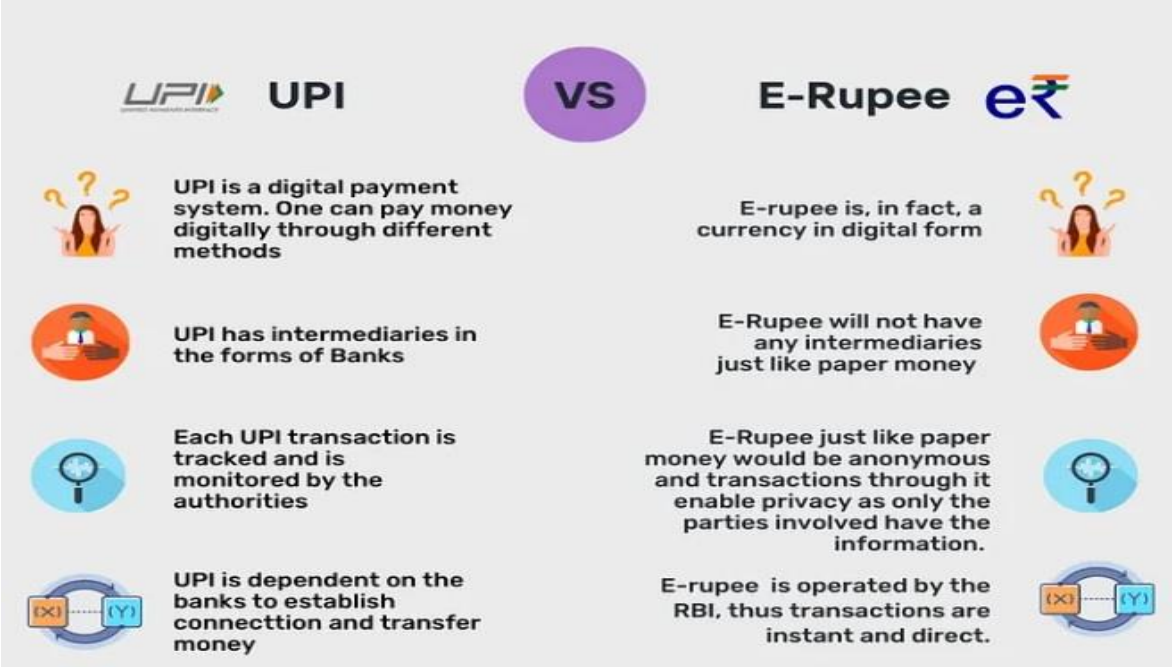
The working mechanism of the e-Rupee involves a two-tier model. In this system: The RBI issues the digital currency to selected commercial banks. These banks then distribute the e-Rupee to the general public via digital wallets. Users can load e-Rupee into their wallets by converting funds from their regular bank accounts. Once loaded, they can transfer, receive, or pay for goods and services using QR codes or wallet-to-wallet transactions. The wallets display digital denominations like ₹100 or ₹500, making it feels similar to handling physical cash.



One of the most promising aspects of the e-Rupee is its ability to operate offline—a critical feature for promoting financial inclusion in rural and low-connectivity areas. This offline capability is still under development but is expected to allow transactions even in the absence of internet access. Another key feature is no involvement of third-party apps or intermediaries (like Google Pay or PhonePe), reducing the chances of failure, fraud, or delay. Additionally, e-Rupee is non-interest bearing, meaning it acts exactly like physical currency and cannot earn interest when stored in the wallet.Understanding this structure is essential to evaluate how the e-Rupee can revolutionize India's financial landscape, ensure secure digital transactions, and bring more people into the formal economy.

2.To compare the benefits and challenges of e-Rupee with other digital platforms like UPI

This objective focuses on conducting a comparative analysis of the e-Rupee—India's Central Bank Digital Currency (CBDC)—with existing digital payment platforms, especially the Unified Payments Interface (UPI). As both systems serve the purpose of enabling cashless transactions, understanding their similarities, differences, benefits, and limitations is vital to assess the role of the e-Rupee in India's evolving digital economy. The Unified Payments Interface (UPI), launched in 2016 by the National Payments Corporation of India (NPCI), is one of the most widely used digital payment systems in India. It allows users to link their bank accounts to mobile apps and make instant money transfers using virtual payment addresses (VPAs), mobile numbers, or QR codes. UPI has gained massive popularity due to its convenience, speed, and interoperability with multiple banks and third-party applications such as Google Pay, PhonePe, Paytm, etc.In contrast, the e-Rupee is a digital version of physical cash, issued and regulated directly by the Reserve Bank of India. It can be stored in digital wallets provided by banks and used for direct wallet-to-wallet transfers, without the involvement of third-party apps or payment gateways. The peer-to-peer nature of e-Rupee offers greater resilience, especially during times of technical disruptions in UPI infrastructure or app outages.



Benefits of e-Rupee over UPI:

- No Intermediaries: e-Rupee enables direct transactions without dependence on third-party platforms or network switches, reducing failure rates.
- Offline Capability: The potential for offline transactions makes e-Rupee more suitable for rural and remote areas with poor internet connectivity.
- Better Control & Security: Since e-Rupee is issued by the central bank, it offers high trust, transparency, and traceability.
- Reduced Costs: e-Rupee eliminates transaction charges for both sender and receiver, which benefits small-value and subsidy-based payments.

Challenges of e-Rupee Compared to UPI:

- Limited Rollout: While UPI is available nationwide, e-Rupee is still in the pilot phase and accessible only in select cities.
- Low Public Awareness: Most users are unfamiliar with CBDC concepts, unlike UPI which is now a household name.
- No Interest: Unlike bank balances linked with UPI, funds held in e-Rupee wallets do not earn interest.
- Limited Integration: UPI offers seamless integration with merchants and services; such an ecosystem is still developing for e-Rupee.

To study the impact and future potential of e-Rupee in India's financial inclusion

The third objective of this study is to analyze how the e-Rupee can impact and contribute to financial inclusion and the broader digital economy in India, both in the present and in the future. As the country continues its rapid shift toward digitalization, especially in financial services, the e-Rupee offers a new tool with the potential to transform how citizens interact with money and the banking system.Financial inclusion refers to providing affordable and accessible financial services—such as savings, credit, payments, and insurance—to all individuals, especially the economically weaker and underserved segments of society. Despite significant progress through schemes like Jan Dhan Yojana, UPI, and Aadhaar-linked banking, millions in rural and remote regions remain unbanked or underbanked. The e-Rupee is seen as a solution that can bridge this gap by offering a secure, easy-to-use, and cash-like digital alternative to physical currency.One of the key features of e-Rupee is its offline functionality, which can enable transactions even in areas without internet or smartphone access. This makes it ideal for rural India, where infrastructure and connectivity are often inadequate. Through partnerships with banks and telecom providers, e-Rupee can reach last-mile users and bring them into the formal digital economy.In addition, the e-Rupee can streamline Direct Benefit Transfers (DBTs) from the government, including subsidies, pensions, and welfare payments. These can be sent directly into a user's digital wallet, reducing leakages, corruption, and delays. Such features make e-Rupee not only a payment mechanism but also a policy tool for targeted financial outreach.From a macroeconomic perspective, e-Rupee can reduce the costs of printing, storing, and transporting physical cash, thus benefiting the government and banks. It can also increase the traceability and transparency of financial transactions, thereby reducing the flow of black money and enabling better tax compliance.

In the future, the e-Rupee could support cross-border trade and remittances, allowing Indians to send or receive money globally with minimal transaction fees and faster settlements. Additionally, its integration into India's growing digital infrastructure (like ONDC, Aadhaar, and DigiLocker) could create a more inclusive, efficient, and secure financial ecosystem.Overall, this objective aims to understand how the e-Rupee can act as a catalyst for digital financial empowerment, helping India achieve its goals of inclusive growth and a cash-light economy.

Findings of the Study

1. Efficient Design and Direct Transactions:The e-Rupee is structured as a sovereign digital currency issued by the RBI, enabling direct wallet-to-wallet transactions without intermediaries. This design ensures faster settlement, reduced failure rates, and better transaction traceability.
2. Two-Tier Operating Model:The e-Rupee operates on a two-tier model, where the RBI issues the currency to selected banks, which then distribute it to users. This maintains central control while allowing easy retail access via bank wallets.
3. Visual Denominations Enhance Usability:The digital wallet displays currency in standard denominations (e.g., ₹100, ₹500), offering users a familiar cash-like experience that simplifies digital currency handling for non-tech-savvy individuals.
4. Offline Capability Promotes Rural Inclusion:Planned offline functionality is a major innovation, allowing users in areas with poor or no internet access to still use e-Rupee, significantly boosting financial inclusion efforts in remote regions.
5. No Dependency on Third-Party Apps:Unlike UPI, which relies on apps like Google Pay or PhonePe, e-Rupee works directly through bank-provided wallets, reducing dependency on private intermediaries and lowering transaction risks.
6. No Interest on Balance:e-Rupee balances do not earn interest, mirroring the behavior of physical cash. This may limit its appeal to those who prefer storing funds in interest-bearing savings accounts.
7. Limited Rollout and Awareness:Currently, the e-Rupee is available only in pilot cities with limited user groups. Public awareness, especially among rural populations, remains low, affecting adoption rates.
8. UPI Offers Better Ecosystem Integration:UPI is already deeply integrated with merchant systems, e-commerce platforms, and utility services. In contrast, e-Rupee is still developing such partnerships and usage networks.
9. Enhanced Security and Regulatory Oversight:As an RBI-issued currency, e-Rupee offers high credibility and tighter regulatory control compared to third-party platforms, enhancing user trust and reducing the risk of fraud.
10. Promising Tool for Government Welfare Delivery:e-Rupee can be used for direct transfers of subsidies, pensions, and welfare payments, ensuring full transparency and eliminating middlemen in the disbursal process.
11. Potential to Reduce Currency Management Costs:By digitizing transactions, e-Rupee could significantly cut down costs related to printing, transporting, and securing physical cash across the country.
12. Scope for Future Cross-Border Transactions:With proper international collaboration, the e-Rupee has potential to be used in cross-border remittances, offering faster and cheaper alternatives to existing methods.

Suggestions:

1. Expand Rollout Beyond Pilot Cities:The RBI should extend the availability of e-Rupee to Tier-2, Tier-3 cities, and rural areas to ensure widespread adoption. Gradual nationwide implementation will provide better data for performance analysis and build user confidence.
2. Enhance Public Awareness and Education:Launch massive awareness campaigns in regional languages through TV, radio, schools, and social media to educate people about the use, benefits, and safety of e-Rupee. Financial literacy programs must be integrated at the grassroots level.
3. Incentivize Early Adoption:Offer small cashbacks, discounts, or rewards for using e-Rupee in day-to-day transactions to encourage both consumers and merchants to adopt the new system. Government schemes can be routed via e-Rupee to boost usage.
4. Strengthen Merchant and Service Integration:e-Rupee should be integrated with point-of-sale (POS) systems, e-commerce platforms, and utility payment portals to increase its usability in regular transactions, just like UPI.
5. Accelerate Offline Functionality Development:To truly reach unbanked populations in low-connectivity regions, RBI and banks must prioritize the development and rollout of offline transaction capabilities, using technologies like NFC or SIM-based solutions.
6. Ensure Interoperability with Other Digital Platforms:Though e-Rupee is a standalone system, some level of interoperability with UPI or wallet-based apps could make user experience smoother and reduce system switching friction.
7. Provide Robust Customer Support and Recovery Mechanisms:A 24/7 multilingual helpline, along with simple wallet recovery options in case of phone loss or theft, will help users feel secure and reduce hesitation in adopting digital currency.
8. Regular Monitoring and Policy Adaptation:RBI should continuously gather user feedback, monitor transaction trends, and refine policies related to transaction limits, wallet usability, and privacy concerns to improve system effectiveness and trust.

Conclusion

The introduction of the e-Rupee by the Reserve Bank of India marks a significant step toward a secure, cashless, and inclusive digital economy. The study highlights its direct, intermediary-free structure, offline functionality, and strong potential for rural outreach and government welfare delivery. However, challenges like limited rollout, low public awareness, and lack of ecosystem integration remain. With strategic expansion, user education, and infrastructure support, e-Rupee can complement existing systems like UPI and enhance India's financial ecosystem. Its success depends on continuous innovation, policy support, and ensuring accessibility for all sections of society.

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