Bulletin of Nexus
Multidisciplinary International Research Journal, Double-Blind Peer Reviewed, Open Access Journal
ISSN : 3065-7865 / Volume-2, Issue-4 / April - 2025

Original Article

Blockchain and Cryptocurrencies: Paving the Path for the Future of Secure Digital Transactions

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Manuscript ID:
BN-2025-020402

ISSN: 3065-7865

Volume 2

Issue 4

April 2025

Pp 8-12

Submitted: 30 Jan 2025

Revised: 05 Feb 2025

Accepted: 10 Mar 2025

Published: 30 Apr 2025

DOI:
10.5281/zenodo.15655459

DOI link:
https://doi.org/10.5281/zenodo.15655459

Abstract

Blockchain technology and cryptocurrencies have evolved as transformative forces in the landscape of secure digital transactions. In recent years, India has recorded an increase in blockchain adoption in areas such as governance, finance, healthcare and education. This study examines how blockchain, as a decentralized, transparent ledger system, revolutionizes traditional models of trust and records. This study focuses on India's unique travels characterized by a frenzied public introduction of cryptocurrency and concurrent regulation uncertainty. The Reserve Bank of India has launched pilot projects for digital rupees and selected states, but challenges exist, including blockchain for land registration and academic accreditation, political gaps, scalability, and a lack of trained professionals. This study is based on secondary data and related reports, including reports from the NITI Aayog, Chain lysis, and RBI, to assess the possibilities and limitations of blockchain solutions. It also reflects the impact of taxation and legal grey areas on Indian cryptocurrencies. By analyzing trends and application cases, this paper shows how blockchain can reduce fraud, increase efficiency, and promote integrated growth when in line with strategic government and education reforms. As India continues to become digital, blockchain is not only a technology but also a fundamental pillar of the future of the digital economy.

Keywords: *Blockchain, Cryptocurrency, India, Decentralized, Financial, Finance, Healthcare, RBI*

Introduction

Technological obstacles are becoming increasingly important for financial innovation in a rapidly changing global economic situation. One of the most important advancements is the rise in blockchain technology and its use in cryptocurrencies. A decentralized, immutable digital high-major book, Blockchain offers innovative ways to record, protect and check transactions across a variety of sectors. The ability to remove intermediaries, ensure transparency, and improve security protocols has led to global recruitment initiatives, particularly in financial services (Tapscott & Tapscott, 2016; Swan, 2015). It currently plays a key role in decentralized finance (DEFI), smart contracts, supply chain management, and asset tokenization (Kshetri, 2018). Bitcoin, the first cryptocurrency created by Nakamoto in 2008, marked the first practical application of the blockchain (Nakamoto, 2008). Since then, the cryptocurrency landscape has exploded by over 22,000 coins around the world at the beginning of 2024. This represents a market valuation of over $1.5 trillion (Coindesk, 2023). Indian scenario: Interactions with Indian cryptocurrencies were not recorded dynamically. The country is one of the five global users of crypto assets. Meanwhile, regulatory challenges such as 30% of men in 2022 are the results of 2022, with 1% of TDs in trades having complex problems for both investors and innovators (RBI, 2022).

Despite regulatory ambiguity, Indian fintech companies and blockchain startups have investigated energy-decentralized applications, particularly in areas such as cross-border payments, agricultural supply chains, identity testing, and even academic accreditation (Regaindoc, 2021). This coexistence of innovation and regulations embodies the key voltages in India's digital wealth situation. El Salvador Bitcoin accepts it as a legal offer, but countries such as China have imposed restrictions on mining and trading cryptocurrencies and digital currencies (digital banks). Sovereignty and refinement of supply chain processes. It attempts to analyze the development, implementation, and regulatory environment of India's blockchain and cryptocurrency. Using secondary data from research documents, state reports, and academic articles, this study assesses the potential of blockchains that will impact the future of secure digital transactions. With solid digital public infrastructure (such as Aadhaar, UPI, and Digilocker), India has the distinct advantage of leading the next stage of blockchain-powered financial evolution.

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How to cite this article:

Joshi, K. S. (2025). Blockchain and Cryptocurrencies: Paving the Path for the Future of Secure Digital Transactions. Bulletin of Nexus, 2(4), 8–12. https://doi.org/10.5281/zenodo.15961135

Quick Response Code:

Website: https://bnir.us

Review of Literature

The body of literature on blockchain technology and cryptocurrencies reflects a fast-changing domain characterized by innovation, regulatory developments, and industry disruption. Researchers, organizations, and government entities have examined the core principles, economic effects, and obstacles related to this evolution.

1. Nakamoto's (2008) whitepaper on Bitcoin established the basis of a distributed peer-to-peer transaction network that eliminated the need for intermediaries. In this groundbreaking document, blockchain was introduced as an unreliable and transparent general book that challenged the traditional centralized banking model.
2. In the Blockchain Revolution, Tapscott and Tapscott (2016) built on this idea, concluding that blockchain impacts far exceed funding, which will change sector-wide possibilities from healthcare to governance. The analysis shows that true values can be found not only in cryptocurrencies but also in blockchain as a scaffolding.
3. Swan (2015) The term "Blockchain 2.0" is presented due to its technical architecture and applicability in various fields. B. Describes functions beyond currency, such as intelligent contracts and decentralized applications.
4. Kshetri (2018) examined the contribution of blockchain to achieving supply chain destinations, and concluded that the most direct benefits are transparency and traceability. The results support the idea that blockchains will be reduced, be more efficient, and encourage trust in decentralized systems.
5. Yermack (2017) examined the impact of corporate governance on blockchain and suggested that immutable ledgers could promote greater accountability in financial reporting and voting for shareholder systems. This perspective is particularly important for developing countries, such as India, where governance issues remain dominant.
6. The World Economic Forum (2021) A major challenge for widespread use is to specify a practical framework for implementing blockchain, stone cleaning, interoperability and regulatory orientations. Their report asked deciders to focus on the use of a particular application rather than a broad theoretical application.
7. NITI Aayog (2020), The main politics of India presented strategic papers campaigning on the use of blockchain in agriculture, healthcare, land records and public sales systems. They highlighted that India could potentially address traditional infrastructure challenges by integrating blockchain into different sectors.
8. The Reserve Bank of India (2022) has pushed for a careful attitude. The RBI recognized the promises of blockchain and pointed to volatility, security issues, and financial stability as reasons for resistance to unregulated cryptocurrency consumption. However, it supports the implementation of digital currencies (central bank digital currencies) under regulated conditions.
9. Chainalysis (2023) India reported that it is one of the leading countries in the introduction of cryptocurrency. Despite regulatory restrictions, India's population shows a significant increase in digital assets, particularly in Tier 2 and Tier -3 cities.
10. LegitDoc (2021), the blockchain startup, has collaborated with the Maharashtra State Commission to present a practical application by exhibiting the Anti-Operation Academic Certificate through the Blockchain. This initiative shows how distributed systems can improve public-sector data checks.
11. Finally, PwC (2021) estimated that blockchain could increase by $1.76 trillion by 2030 to as many as $1.76 trillion. The report discovered five important domains that blockchain will likely have a major impact on: payments, identity, contracts, and customer loyalty.

Research Methodology

Research Design: This study focuses primarily on secondary data sources and examines the development, implementation, and effectiveness of blockchain and cryptocurrency in digital financial systems, particularly in India digital financial systems. Considering the dynamic and emerging nature of the subject, we use conceptual approaches supported by empirical data to critically examine trends, challenges, and opportunities associated with decentralized financial technologies.

Research Objectives:

1. A study of the technical fundamentals and economic use of blockchain and cryptocurrency.
2. An investigation into Indian cryptocurrency regulations and political measures.
3. Assessing the potential of blockchain in improving secure digital transactions with Indian digital frameworks.

Investigate data control patterns as they take over cryptocurrency, blockchain integration, and financial innovation.

Scope: The parameters of this study will be limited until the beginning of 2024, highlighting India and simultaneously comparing it at the global level. The collection of primary data, such as time- and resource-based surveys and interviews, was excluded.

Limitations: The restrictions also include the development of rapid regulatory terms, lack of standardized definitions of cryptocurrencies, and limited access to exclusive blockchain usage data within Indian organizations.

Analysis

1. **Rise of Blockchain Technology in India and Globally:** The blockchain versions around the world are estimated to be around US$6.6 billion in 2021, predicting it could exceed $19 billion by 2024 (Statista, 2023). India has made rapid progress in the blockchain sector, particularly since the introduction of MEIT's national blockchain strategy in 2021. More than 40 blockchain initiatives are either pilots or operating stadiums from various state

governments. According to Niti Aayog's (2020) strategy, blockchains can change sectors such as land records, agricultural supply chains, healthcare, and educational accreditation. Regions such as Maharashtra, Telangana, and Andhra Pradesh have already begun to display land and box certificates using blockchain technology to minimize cases of fraud and human error.

2. **Cryptocurrency Adoption in India:** India has reached its highest position in the introduction of global cryptocurrency, in accordance with the Global Cryptocurrency Index 2023 issued by Chain lysis. Some notable figures include the following.

1. Since 2023, India has had over 115 million cryptocurrency users (Triple-A Report).
2. The Indian crypto market is expected to reach USD 241 million by 2030, with an annual growth rate (CAGR) of 7.8% (Statista, 2023).
3. Retail transactions account for 95% of crypto activity in India and emphasize widespread acceptance rather than institutional investment.

Despite uncertain regulations, India is experiencing an increase in local platforms with millions of registered users including Coindex, Wazir, and Coin switch Kuber. For example, Cinswitch has reported 14 million users by the end of 2022.

3. **Blockchain Use Cases in Indian Governance:**

State/ Indian Governance	Blockchain Use
Maharashtra: Academic Certificates	1. LegitDoc, developed for output of operational final certificate. 2. Blockchain technology issues over 50,000 certificates and removes delays in checking and preventing counterfeit products. 3. Third-party review times have been reduced by 60%, providing greater transparency.
Telangana: Land Registry	1. Integrating blockchain technology into revenue sector. 2. Over 1,000 land packages have been digitized. Pilot research has reduced controversial entries by 94% and improved public confidence.
Kerala: Healthcare Blockchain	1. Blockchain technology implemented for the management of digital health records. 2. Average reviews shortened and overlapping times increased by 30 40%. 3. Improved patient privacy with the crypto identity layer.

4. **Blockchain in Banking and Finance:** Reserve Bank of India (RBI) has been testing the Digital Rupee (e₹) initiative since 2022.

1. Retail CBDC pilots were launched in December 2022 in cities, such as Mumbai, Delhi, and Bengaluru.
2. Thirteen major banks, including SBI, ICICI, and HDFC Bank, joined the pilot.
3. By 2023, over 800,000 transactions had successfully completed during the pilot.
4. The goal is to reduce dependence on physical currencies and provide programmable money.

Additionally, banks, such as Yes Banks and ICICI, use blockchain technology for cross-border transfers and trade financing. For example, ICICI was able to use blockchain to conduct over 250 trade finance transactions in 2023.

5. **Crypto Taxation Impact:** In 2022, India placed a 30% tax on cryptocurrency profits and earned taxes, along with a 1% TD that can be used for each transaction.

1. The immediate effect was a significant decrease in daily trade volumes to Indian stock exchanges, which fell by 70% (Crebaco Global) within one week of the introduction.
2. Many stock exchanges have moved to Dubai or Singapore to avoid tax hindrances.
3. Despite tax measures, the number of downloads from Crypto's letters continues to increase, indicating a sustainable interest in the long term.

6. **Global Comparison:**

Country	Legal Status	Tax Rate	CBDC Status	Blockchain Projects
India	Legal grey	30% + TDS	Pilot	40+
USA	Regulated	Capital Gains	In R&D	300+
China	Banned	N/A	Fully launched (e-CNY)	200+
UAE	Regulated	0%	Research stage	50+

This shows that India has both advantages and bottlenecks—it is ahead in pilot-use cases, but behind in policy clarity.

7. **Challenges in Indian Blockchain Ecosystem:** Scalability: Public blockchains such as Ethereum can handle 15 transactions per 15 s (TPS), but India needs infrastructure that can support 50,000 TPS to achieve UPI-like scaling.

1. Energy Consumption: Bitcoin's annual electricity consumption is approximately 127 TWH, and the Indian electricity system must prevent overloading by a workplace-based certification (POW) chain.
2. Political Vacuum: Several designs have been proposed since 2019; however, there is no comprehensive regulatory framework for cryptocurrencies.
3. Integrity Gap: According to a 2023 Nasscom report, only about 10% of the IT workforce received training courses in blockchain technology.

4. Interoperability: Current systems between banks, insurance companies, and government organizations are not compatible with blockchain technology.

8. Opportunities and Future Outlook:

1. India's Web3 economy could acquire a value of USD 1.1 trillion by 2032 if the guidelines and infrastructure are in harmony (Bain & Co, 2023).
2. Youth Population: Over 50% of Indian residents are under the age of 25, enabling rapid and scalable adoption of technology.
3. Digital India Initiative: Government support for e-government and Digital Identification (AADHAAR) naturally focuses on blockchain technology.
4. Startup Landscape: India offers over 450 active blockchain startups (Story 2023) with the Defi and NFT platforms.

Discussion

India is at the top of the adoption of blockchain and cryptocurrency but meets issues of regulation, structure, and scalability, highlighting the complex situation of a country's progress and uncertainty. Various states and private organizations consider blockchain applications for governance, finance, and records. This demonstrates institutional trust in real systems such as India's E-Benavente Bank. The implementation of a 30% tax and 1% TD for cryptocurrency trading has affected the market. This means that there is a need for comprehensive political and extensive educational initiatives to improve the workforce and technical preparation skills. With demographic benefits, digital infrastructure, and a vibrant startup ecosystem, India could lead the world over in Web3 and blockchain; however, prioritizing clarity, interoperability, and research is important.

Conclusion

Blockchain technology and cryptocurrency are more than just innovations. They represent a fundamental shift in how trust, transparency, and decentralization are understood in digital transactions. In India, this development is already recognized by the provision of public services, increasing cryptocurrency users, and effective blockchain applications in the positive attitude towards digital central bank currencies.

Regulatory uncertainty and infrastructure challenges exist; however, India's initiative has created a robust foundation. Implementing blockchain in areas such as land registration, digital identification, and academic login reviews demonstrates that fraud, corruption, and bureaucratic hurdles can be significantly reduced.

Cryptocurrencies may be controversial, but they have sparked debates about economic independence, decentralization, and integrated funding. With the establishment of an appropriate legal framework, India can use this dynamic to promote innovation, generate employment, and improve global competitiveness.

In summary, the introduction of blockchain technology and digital currency in India is more than a technical decision. This national strategy has the potential to change the way economic, government, and digital identities work over the next decade.

Recommendations

A multifaceted strategy is extremely important to fully utilize the possibilities of the Indian blockchain and cryptocurrency.

1. Creating a Final Regulatory Framework: The Indian government must simultaneously determine comprehensive laws that protect consumer rights to determine comprehensive laws that define, regulate, and promote blockchain and cryptocurrency.
2. Cultivating public-private alliances: Cooperation between government agencies and technological innovators can accelerate the implementation of blockchain in areas such as governance, healthcare, and education.
3. Leaving crypto taxation: Regulations are necessary, but growth stops excessive taxes. Implementing control classes based on TDS reductions or revenues can increase compliance and reduce capital outflow.
4. Improved blockchain training: Integrating blockchain fundamentals into university programs, providing certification courses, and encouraging blockchain hackathons to maintain a competent workforce.
5. Startup Environment Maintenance: Providing seed financing, incubation assistance, and experimental zones for Web3 and Defi startups focused on scalable and ethical innovation.
6. Building Scalable Infrastructure: India must develop or use blockchain systems that can manage high transaction volumes using UPIs with energy-efficient consensus mechanisms.
7. Facilitating CBDC implementation: The introduction of the digital rupee must involve user training, dealer incentives, and interoperability with the current fintech frameworks.

   These strategic measures position India as the global leader in secure digital transactions.

Acknowledgement

We appreciate the knowledge and perspectives shared by the academic and institutional works mentioned in this study. Your findings are critical in the comprehensive understanding of blockchain technology and the design of its impact on India. We also want to thank the researchers, government agencies, and technological innovators who have worked with data and case studies as the backbone of this analysis. A warm recognition of gratitude goes to everyone who has thoughtful discussions and supports this research. Based on your contribution, these efforts are wiser and more beneficial.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

References:

1. Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System.* https://bitcoin.org/bitcoin.pdf

2. NITI Aayog. (2020). *Blockchain: The India Strategy – Towards Enabling Ease of Business, Ease of Living and Ease of Governance*. Part 1: 12-18 https://www.niti.gov.in/sites/default/files/2020-01/Blockchain_The_India_Strategy_Part_I.pdf
3. Statista Research Department. (2023). *Blockchain Market Size Worldwide 2017–2024.* https://www.statista.com/statistics/647231/worldwide-blockchain-technology-market-size/
4. Chainalysis. (2023). *Global Crypto Adoption Index 2023.* https://www.chainalysis.com/global-crypto-adoption-index/
5. Reserve Bank of India (RBI). (2022). *Concept Note on Central Bank Digital Currency*: 22-25
6. https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/CONCEPTNOTECB2CD2949EFB4B4D48B097A9B9E87F7FBE2E.PDF
7. Reserve Bank of India. (2022). *RBI Bulletin: Taxation on Virtual Digital Assets*. https://www.rbi.org.in/
8. Crebaco Global Inc. (2022). *Impact Analysis of Crypto Taxation in India.*
9. World Economic Forum. (2021). *Blockchain Deployment Across the Indian Public Sector*: 9-15 https://www3.weforum.org/docs/WEF_Blockchain_Deployment_Across_the_Indian_Public_Sector_2021.pdf
10. Triple-A (2023). *Cryptocurrency Ownership Data – India*. https://triple-a.io/crypto-ownership/
11. Nasscom. (2023). *India's Web3 Start-up Landscape: A 450+ Start-up Ecosystem.* https://nasscom.in/knowledge-center/publications/india-web3-startup-landscape
12. Bain & Company. (2023). *The Web3 Opportunity in India: A Trillion-Dollar Future*: 7-10
13. https://www.bain.com/globalassets/noindex/2023/bain-web3-india-opportunity.pdf
14. YourStory Media. (2023). *India's Top Blockchain Startups to Watch in 2023*. https://yourstory.com/2023/top-blockchain-startups-india
15. LegitDoc. (2022). *Blockchain-Powered Certificate Issuance in Maharashtra*. https://www.legitdoc.com/usecases
16. Ministry of Electronics and Information Technology (MeitY). (2021). *National Strategy on Blockchain.* https://www.meity.gov.in/writereaddata/files/National_Strategy_Blockchain.pdf
17. CoinSwitch. (2022). *User Base Statistics and Industry Report*. https://coinswitch.co/reports
18. ICICI Bank Press Release. (2023). *Blockchain Trade Finance Transactions Overview*.
19. https://www.icicibank.com/aboutus/article.page?identifier=news-2023
20. Tapscott, D., & Tapscott, A. (2016). *Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world. Penguin*.
21. Kshetri, N. (2018). *The Emerging Role of Big Data in Key Development Issues: Opportunities, Challenges, and Concerns. Big Data for Development*, 3–22.
22. Swan, M. (2015). *Blockchain: Blueprint for a new economy. O'Reilly Media, Inc.*
23. CoinDesk. (2023). *Cryptocurrency market capitalization.* https://www.coindesk.com/markets/
24. World Bank. (2022). *Digital Economy in South Asia*. https://www.worldbank.org/
25. Gupta, M., & Jain, R. (2020). *Cryptocurrency in India: Evolution, Opportunities and Challenges. Journal of Financial Regulation,* 12(3), 45-61.
26. EY India. (2023). *How blockchain can revolutionize Indian finance.* https://www.ey.com/en_in
27. PwC. (2022). *Decrypting Crypto: A report on India's digital asset landscape.* https://www.pwc.in/
28. Kumar, A. (2021). *Blockchain adoption in India: A regulatory viewpoint. Indian Journal of Law and Technology,* 17(2), 120-139.
29. Statista. (2024). *Cryptocurrency users in India.* https://www.statista.com/