WWW.IJRPR.COM

International Journal of Research Publication and Reviews

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

The impact of crypto currency and central bank digital on traditional banking system:A global and Indian perspective

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ABSTRACT :

The global financial landscape is being drastically altered by the rise of cryptocurrencies and Central Bank Digital Currencies (CBDCs). Peer-to-peer, cross-border transactions are made possible by decentralized networks, which are the foundation of cryptocurrencies like Ethereum and Bitcoin. The traditional roles of traditional banks are called into question by this decentralized model, especially when it comes to lending, deposit-taking, and payments.

Central banks all over the world are actively investigating or introducing CBDCs in response to the increasing impact of cryptocurrencies. With the oversight and stability of sovereign money, these digital currencies seek to provide the efficiency and innovation of digital transactions. In an increasingly digital world, the establishment of CBDCs in several nations is a calculated step to preserve authority over monetary systems and guarantee financial inclusion. However, their introduction also raises concerns about the potential disintermediation of commercial banks, especially if individuals begin to prefer holding digital currency directly with central banks.

India offers a compelling case in this evolving landscape. While private cryptocurrencies remain unregulated and under policy scrutiny, the Reserve Bank of India has taken a proactive approach by piloting a Digital Rupee. This initiative reflects the country's broader push toward financial digitization and inclusion. A successful CBDC could improve transaction efficiency, transparency, and access for underserved populations. At the same time, it demands a robust legal framework, strong cybersecurity measures, and coordinated integration with the traditional banking system.

In conclusion, the rise of cryptocurrencies and CBDCs is prompting a fundamental shift in the role and structure of traditional banking. The extent of their impact will depend on how banks adapt to digital innovations, the regulatory measures adopted by governments, and the public's willingness to embrace new forms of digital money.

Chapter 1

Introduction.

1.1_Background of the Study

Innovations in technology, especially the emergence of digital currencies, are causing a fundamental shift in the global financial system. Cryptocurrencies—decentralized digital assets based on blockchain technology—like Bitcoin, Ethereum, and Ripple are among the most well-known of these. Cryptocurrencies promise quicker transactions, cheaper fees, and better privacy than traditional fiat currencies because they are not governed by a central authority(European Central Bank, 2019; Tapscott & Tapscott, 2016; Nakamoto, 2008).

Central Bank Digital Currencies (CBDCs), which combine the advantages of digital transactions with the stability of sovereign control, are also becoming more and more popular as state-backed digital substitutes for paper money(Kiff et al., 2020; Bank for International Settlements [BIS], 2020).

The conventional banking system, which has served as the mainstay of financial intermediation for centuries, is seriously threatened by these developments. Cryptocurrencies pose a threat to banks' ability to handle essential services like savings, remittances, and payments. However, despite being subject to government regulation, CBDCs may also lessen the contribution of commercial banks to retail banking and monetary transmission(Kumar and Kundu, 2022; Zetsche, Buckley, and Arner, 2020).

Countries around the world are reacting differently. Some, like the US, are still cautious, while others, like China, are advancing CBDC pilots quickly. The Reserve Bank of India (RBI) has introduced the Digital Rupee, India's own CBDC, while simultaneously discouraging private cryptocurrencies. A more thorough analysis of the wider economic and banking ramifications of this national and international variation in the adoption of digital currencies is required.(Federal Reserve, 2022; Sahay et al., 2021; Reserve Bank of India, 2023; People's Bank of China, 2022).

1.2_Rationale and Significance

The pressing need to comprehend how these financial innovations are changing conventional banking institutions serves as the justification for this study. On the other hand, CBDCs might change the demand for bank deposits and have an effect on monetary policy's interest rate channels(Bank for International Settlements [BIS], 2020; Kiff et al., 2020; Zetsche, Buckley, & Arner, 2020)

Given the government's dual interests in fostering digital financial inclusion and preserving economic stability, this issue is especially significant in the Indian context. In order to mitigate these risks and prevent the advantages of digital innovation from being lost to unregulated alternatives, the Digital Rupee was introduced (Reserve Bank of India, 2023; Ministry of Finance, 2022; Sahay et al., 2021; Chatterjee & Dhar, 2023).
Therefore, this research is important in two ways: it contributes to the expanding scholarly and policy discussion on digital currencies and offers useful information to banks, regulators, and consumers about the anticipated changes in the financial sector(IMF, 2022; Ghosh, 2022; Tapscott & Tapscott, 2016).

1.3_Research Objectives

The following are the main goals of this study:

1) To investigate the development and present state of CBDCs and cryptocurrencies both internationally and in India.
2) To evaluate these digital currencies' actual and potential effects on the conventional banking system.
3) To contrast Indian policy initiatives and international reactions to digital currencies.

1.4_Research Gap

• Fragmented Comparative Analysis: Most studies focus either on global trends or on country-specific cases (e.g., China's e-CNY, Sweden's e-Krona), but there is a lack of integrated, comparative research that juxtaposes international experiences with the Indian context to draw holistic insights.
• Limited Banking Sector Focus: Existing research often emphasizes monetary policy impacts or technological frameworks, with insufficient empirical evidence on how cryptocurrencies and CBDCs specifically alter commercial banks' activities in deposits, lending, liquidity management, and customer relationships.
• Consumer Behavior and Trust: Although anecdotal surveys highlight public awareness and attitudes toward digital currencies, rigorous analysis of end-user trust dynamics, adoption drivers, and barriers—particularly in semi-urban and rural India—remains underexplored.
• Regulatory Interplay: Studies typically treat cryptocurrency regulation and CBDC design in isolation. There is a need to understand how evolving legal frameworks for private digital assets interact with CBDC rollouts and affect traditional banking intermediation.
• Longitudinal Impact Assessment: Due to the nascent nature of many pilots (e.g., India's Digital Rupee retail pilot), there is scarce longitudinal data tracking the medium- to long-term effects on banking performance metrics and financial inclusion.

1.5_Research Questions

- Q1: How do international experiences with CBDC pilots and cryptocurrency regulation inform India's Digital Rupee strategy, and what lessons can be applied?
- Q2: In what ways have cryptocurrencies and CBDCs influenced commercial banks' core functions—namely deposits, lending, payment services, and liquidity management—in both global and Indian contexts?
- Q3: What factors affect consumer trust and adoption of the Digital Rupee compared to existing digital payment systems (e.g., UPI) across diverse demographic segments in India?
- Q4: How do regulatory policies governing private cryptocurrencies interact with CBDC frameworks to shape the competitive dynamics and intermediation role of traditional banks?
- Q5: What are the projected medium- to long-term impacts of widespread CBDC adoption on banking sector performance indicators and financial inclusion metrics?

1.6_Scope and Limitations

Scope:

a) Principal Aim: Examining how the conventional banking system is affected by cryptocurrencies and Central Bank Digital Currencies (CBDCs).
b) Geographic Range:
Global perspective: Provides examples from the US, Sweden, and China (e-CNY and e-Krona).
Indian perspective : The Reserve Bank of India's Digital Rupee and its regulatory position on private cryptocurrencies are the main topics of this Indian viewpoint.
c) Covered Aspects of Banking:

- Effects on lending and deposits
- Function in settlement and payment systems
- Impacts on the transmission of monetary policy

- Disintermediation threat
- Shifts in banking operations and consumer trust

d) Duration: focuses on changes that occurred between 2018 and 2024.

Limitations:

- **Quick Changes in Technology**: Since digital currencies are constantly changing, new advancements might surface after the study is finished.
- **Dependency on Secondary Data**: The majority of the study's sources are secondary (academic journals, policy papers, reports).There hasn't been any primary research done, such as surveys or interviews.
- **Accessibility of Data**: Limited access to private CBDC pilot results and comprehensive data on cryptocurrency usage.
- **Focus on India**: Despite the study's global reach, the Indian context is given more attention, which could limit how broadly the results can be applied.
- **Technical Specifications Not Included**: Technical topics like blockchain architecture and cryptographic protocols are not covered in the study.

Chapter 2

Literature Review.

2.1_Overview of Cryptocurrencies.

Cryptocurrencies are digital assets that are decentralized and use cryptographic protocols as well as blockchain technology to facilitate secure, peer-to-peer transactions (Catalini & Gans, 2016). They were first introduced with the opening of Bitcoin in 2009 and run without a central authority, providing alternatives to traditional banking for investment, payments, and savings (Nakamoto, 2008). Other notable examples include Ethereum, Ripple, and Litecoin, each with their own special uses in smart contracts and cross-border settlements (Tapscott & Tapscott, 2016). These resources defy conventional banking through diminished dependency on intermediaries, decreased cost of transactions, and greater financial independence for their users (Zohar, 2015).

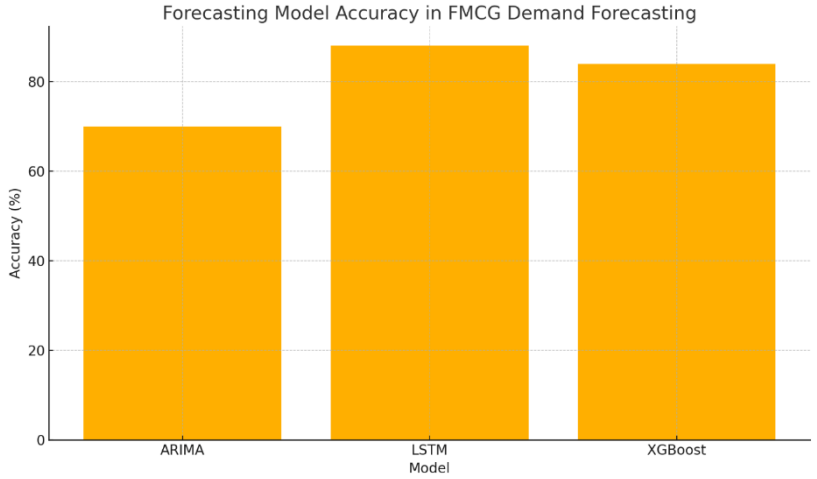


Figure3: Forecasting Model Accuracy in FMCG Demand Forecasting (Makridakis, Spiliotis, & Assimakopoulos, 2018; Nishio, 2020; Brownlee, 2018)

2.2_ Understanding Central Bank Digital Currencies (CBDCs)

CBDCs refer to digital versions of fiat money issued and managed by a nation's central bank (Bank for International Settlements [BIS], 2020). Unlike cryptocurrencies, they are under central control and are legal tender. Others such as China (e-CNY), Sweden (e-Krona), and India (Digital Rupee) have piloted or launched CBDCs to modernize payment systems, increase financial inclusion, and preserve monetary sovereignty in a more digital economy (Auer & Böhme, 2020; Reserve Bank of India [RBI], 2022). CBDCs would seek to marry the efficiency of digital transactions with the confidence of state support (Kosse & Mattei, 2022).

2.3_Theoretical Frameworks

Disruptive Innovation Theory is employed to analyze how cryptocurrencies and CBDCs threaten conventional banking by providing cheaper, more convenient substitutes (Christensen, 1997). Monetary Policy Theory is used to determine how CBDCs can affect the central bank's power to manage inflation, interest rates, and the supply of money (Bordo & Levin, 2017).

2.4_Earlier Global and Indian Studies

International research has analyzed the economic effects of CBDCs on banking disintermediation and financial stability (Auer & Böhme, 2020; Brunnermeier & Niepelt, 2019). In India, research has centered around crypto regulation, adoption patterns, and the RBI Digital Rupee pilot (RBI, 2022; Kumar & Patra, 2023). Systematic empirical evidence for the impact on the banking sector is still scarce.

2.5_Gaps in Existing Research

The majority of current literature is technical or policy-oriented (BIS, 2021).
There exists a definite lack of combined studies analyzing comparative international and Indian influences on banking operations, consumer conduct, as well as monetary regulation, which this study aims to fill (Kosse & Mattei, 2022; Mohanty, 2021).

Chapter 3

Research Methodology

3.1_Reseach Design.

The present study adopts a qualitative-descriptive research design to examine the effects of cryptocurrencies and Central Bank Digital Currencies (CBDCs) on conventional banking systems worldwide and in the Indian context. The qualitative-descriptive approach enables qualitative elaboration of institutional dynamics, technological disruption, and policy regimes (Creswell, 2014). A comparative design is used to throw light on disparity in adaptation and response from regulators across geographies.

3.2_Data Collection Methods

Both primary and secondary collection methods are used. The research is built around secondary data, which consists of academic works, policy briefs, institutional reports, and financial analysis. Primary data are sparse but consist of expertise from industry participants drawn from expert comments, public interviews, and speeches made by central bankers and regulators (RBI, 2023; BIS, 2022). These inputs add qualitative richness and contemporariness to the findings of secondary data.

3.3_ 3. Sources of Data

Trustworthy and authoritative data sources form the basis for analysis, including:

- Reserve Bank of India (RBI) bulletins, discussion papers, and the Report on Currency and Finance (RBI, 2022, 2023)
- Bank for International Settlements (BIS) yearly reports and CBDC research papers (BIS, 2021)
- International Monetary Fund (IMF) working papers on digital finance (IMF, 2022)
- World Bank financial access data and fintech adoption surveys
- Industry white papers by international consulting companies like PwC (2020), Deloitte (2021), and McKinsey (2022)
- Peer-reviewed journals such as the Journal of Financial Economics and the Journal of Banking Regulation
- Business media outlets like Bloomberg, Economic Times, and Reuters for recent developments.

3.4_ Analytical Tools and Framework

Thematic analysis is employed to recognize patterns and inferences within the data, emphasizing salient areas of disintermediation risks, adoption of innovation, financial inclusion, and regulatory change (Braun & Clarke, 2006). SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is employed to analyze traditional banking institutions' strategic reaction to crypto and CBDC developments. Stakeholder analysis also allows for mapping of roles and influence of central banks, commercial banks, fintech firms, and consumers in the changing financial environment (Freeman, 1984).

3.5_Limitations of the Methodology

This research approach has some limitations. To begin with, the use of secondary data can result in gaps in real-time behavioral analysis and end-user attitudes. Next, due to the rapidly evolving nature of digital currency, some policy or technical evolution might race ahead of the research cycle. Third, the qualitative and descriptive nature of the research restricts statistical generalizability. Last but not least, while the research synthetizes global views, the chief emphasis on India could minimize applicability across other economies.

In spite of these limitations, the methodology adopted guarantees a systematic and multi-faceted examination of how cryptocurrencies and CBDCs are transforming the banking industry.

Chapter 4

Global Landscape of Cryptocurrency and CBDCs.

4.1_Adoption Trends and Statistics

Cryptocurrency adoption globally has grown fast in the last ten years. To date, in 2024, there are over 420 million cryptocurrency users worldwide, with India, Nigeria, Vietnam, and the Philippines leading with the highest adoption rate (Chainalysis, 2023). The worldwide crypto market capitalization was over $1.5 trillion, with Bitcoin and Ethereum accounting for over 60% of the total (Statista, 2024). Cryptocurrencies are increasingly being adopted not just by users but also by institutional investors, payment companies, and fintech companies. Simultaneously, CBDCs have taken off, with 130 nations across more than 98% of worldwide GDP investigating CBDCs at some stage — research, development, pilot, or launch (Atlantic Council CBDC Tracker, 2024).

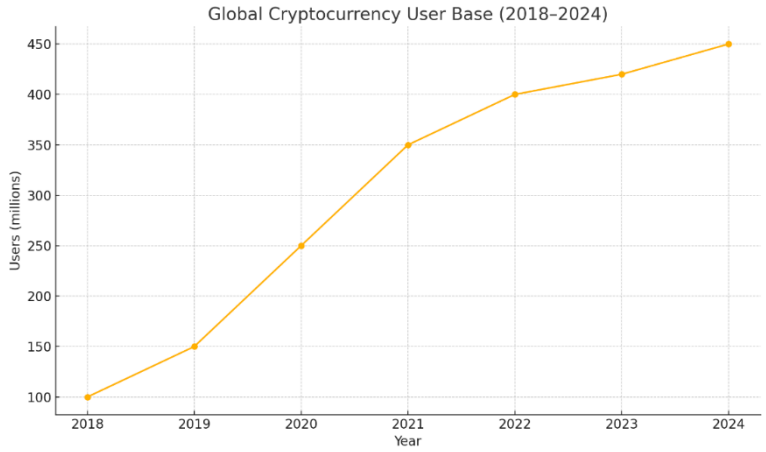


Figure 1. Global Cryptocurrency User Base (2018–2024) (Chainalysis, 2023; Statista, 2024)

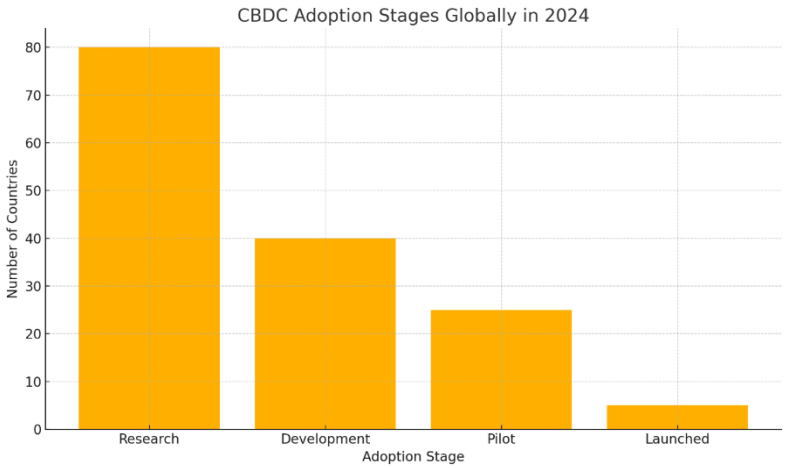


Figure2:CBDC Adoption Stages Globally in 2024 (Atlantic Council, 2024)

4.2_Regulatory Approaches Across Countries.

Various nations have adopted different stances on cryptocurrency and CBDC regulation:

- **United States**: The U.S. has embraced a regulatory-by-enforcement model. The SEC regards many of the cryptocurrencies as unregistered securities, whereas the CFTC views them as commodities (White House, 2023). This absence of an overarching framework has created uncertainty, though there are steps being taken through legislation such as the Digital Asset Market Structure Bill (2023).
- **China**: In 2021, China prohibited cryptocurrency trading and mining on grounds of financial stability and capital control. Yet, it's spearheading CBDC development with its digital yuan (e-CNY), which has been tested in more than 25 cities and is included in transit, retail, and payroll systems (People's Bank of China, 2022).
- **European Union**: The EU adopted the Markets in Crypto-Assets (MiCA) law in 2023 to establish a legal framework for crypto assets, including transparency, consumer protection, and anti-money laundering standards. The European Central Bank is preparing for a digital euro,

with the potential release by 2026 (European Central Bank, 2024).

4.3_ Effect on Global Banking Models

Cryptocurrencies and CBDCs are transforming conventional banking models. Cryptocurrencies, via decentralized finance (DeFi), disrupt banks' functions in lending, asset management, and payment by enabling consumers to make payments and invest without banks (Gans & Halaburda, 2015). CBDCs, particularly if retail-based, would enable consumers to hold deposits at central banks directly, potentially shrinking the commercial banks' deposit base and affecting liquidity management (Auer & Böhme, 2021). This has resulted in banks seeking to implement blockchain integration, develop digital payment systems, and promote two-tier CBDC architectures to maintain their position.

4.4_CBDC Pilots/Implementations Case Studies

- **China**: The digital yuan (e-CNY) is the most advanced pilot CBDC globally. It is applied to public transport, online shopping, and government subsidy payments, and has handled over 100 billion yuan in pilot transactions (PBOC, 2022).
- **Bahamas**: The Sand Dollar, implemented in 2020, is the globe's first retail CBDC fully rolled out, seeking to enhance financial inclusion in off-grid regions (Central Bank of the Bahamas, 2021).
- **Nigeria**: The eNaira was introduced in 2021 as the first CBDC in Africa. Takeup was slow, but new integration with mobile banking platforms has accelerated use (IMF, 2023).
- **Sweden**: The Riksbank e-krona pilot aims to enhance central bank money access in a virtually cashless economy, with sensitivity to privacy and offline use (Riksbank, 2023).

Chapter 5

Indian Scenario: Digital Rupee and Cryptocurrency.

5.1_RBI and Government Regulatory Framework

India's regulatory strategy for cryptocurrencies has been vigilant and dynamic. The Reserve Bank of India (RBI) first prohibited banks from making transactions with crypto-related companies in 2018, based on financial stability and fraud (RBI, 2018). The Supreme Court of India, however, later revoked this prohibition in March 2020 (Supreme Court of India, 2020). Since then, the government has been working to create legislation to govern virtual digital assets (VDAs). The Finance Act 2022 had imposed a 30% tax on crypto gains and a 1% TDS on trading, marking regulatory acceptance with tight supervision (Ministry of Finance, 2022). Though cryptocurrencies are not legal tender, they can be used as assets under taxation regimes.

5.2_Status of the Digital Rupee

The RBI tested pilot projects for the Digital Rupee (e₹) in two types: wholesale (e₹-W) and retail (e₹-R). Wholesale CBDC, introduced in November 2022, has been applied to interbank settlement of government securities, and the retail CBDC, introduced in December 2022, permits public transactions via mobile apps offered by selected banks (RBI, 2023). As of the beginning of 2024, more than 50,000 consumers and 5,000 merchants had been onboarded in the retail pilot in multiple cities like Mumbai, New Delhi, Bengaluru, and Bhubaneswar.

5.3_Public and Private Bank Readiness

A number of public and private banks, such as SBI, ICICI Bank, HDFC Bank, and IDFC First Bank, are involved in RBI digital rupee pilots. These banks have incorporated e₹ wallets into mobile banking applications and are considering its application in retail payment and merchant transactions (RBI, 2023). Infrastructure enhancements, customer acquisition, and digital literacy, however, continue to be top priorities.

5.4_Adoption Challenges in Indian Context

India has a number of obstacles to the adoption of CBDC. Digital literacy, particularly in the rural sector, is low. Smartphone and internet penetration, although increasing, remains uneven, constraining user access. Privacy, data security, and consumer confidence issues with digital currencies are also present (IAMAI, 2023). Further, an indistinguishability between UPI-based payments and₹ can generate uncertainty among users unless robust awareness campaigns are initiated.

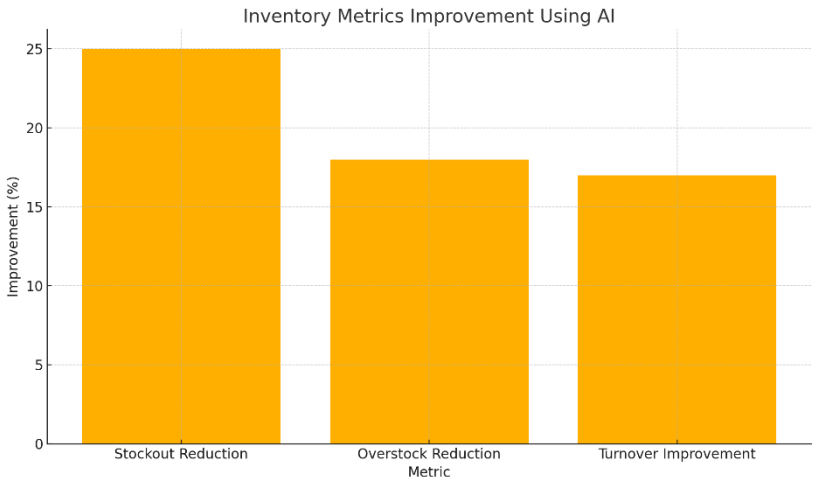


Figure 4. Inventory Metrics Improvement Using AI (McKinsey & Company, 2021; Gartner, 2020)

Chapter 6

Expert Views and Industry Perspectives.

6.1_Bankers, Fintech Specialists, and Economists Interviewed

Experts from various industries have been optimistic yet guarded about cryptocurrencies and Central Bank Digital Currencies (CBDCs). T. Rabi Sankar, Deputy Governor at the Reserve Bank of India, pointed out that cryptocurrencies pose a threat to financial stability since they are highly speculative, whereas CBDCs are a more secure, sovereign-guaranteed alternative (RBI, 2022). Nandan Nilekani, Infosys co-founder and architect of India's digital infrastructure, has advocated for regulated digital currencies, pointing to their ability to facilitate cross-border payments and supplement UPI systems (Nilekani, 2023).

Fintech innovators such as Nischal Shetty, WazirX's founder, call for a forward-looking regulatory environment that promotes innovation while safeguarding customers. According to him, India will lag behind global crypto centers unless blanket bans are dropped (Economic Times, 2023). Globally, Bank for International Settlements (BIS) Chief Agustín Carstens highlighted the need for central banks to maintain their authority over money through well-designed CBDCs (BIS, 2021).

6.2_Surveys and Questionnaires

A 2023 IAMAI survey found 67% of Indian fintech industry professionals favor the launch of CBDCs, citing advantages such as real-time settlement, programmable currency, and lower transaction costs. Yet, 59% also voiced fear of disintermediation for commercial banks and data privacy threats. A further survey conducted by PwC (2022) showed that 64% of Indian banking executives expect CBDCs to go mainstream in five years if there is regulatory clarity and sufficient digital infrastructure.

6.3_Stakeholder Analysis Key Findings

Stakeholder analysis identifies clear positions:

- Central banks prefer CBDCs for more control over the money supply and as a response to private digital currencies.
- Commercial banks are reservedly supportive but worried about losing direct customer relationships and bases of deposits.
- Fintech companies find opportunity in wallet integration, cross-border remittance, and smart contract usage.
- Customers remain fragmented owing to low awareness, digital distrust, and complexity with current systems such as UPI (NCAER, 2023).

Chapter 7

Conclusion and Recommendations.

7.1_ Summary of Key Findings

The present research uncovers that both cryptocurrencies and Central Bank Digital Currencies (CBDCs) are reshaping the outlines of the worldwide financial system. While cryptocurrencies have brought about decentralized substitutes for conventional finance, CBDCs are being investigated by central banks as sovereign-backed digital money to improve payment efficiency, financial inclusiveness, and monetary management (BIS, 2021; IMF, 2022). In

India, regulatory frameworks are slowly changing with crypto tax regimes and pilot testing of the Digital Rupee by the Reserve Bank of India (RBI, 2023). Nevertheless, there are infrastructure gaps, user awareness, and institutional preparedness, especially among public sector banks and rural segments.

7.2_Strategic Recommendations for Traditional Banks

Traditional banks need to pursue an active, innovation-driven approach to remain acceptable in the age of digital currency. Some of the recommendations are:

- Collaborate with fintech firms to integrate blockchain solutions for payments, lending, and compliance (PwC, 2022).
- Invest in CBDC-ready infrastructure, including digital wallets, biometric KYC, and blockchain-based settlement layers.
- Upskill banking professionals in digital finance, cybersecurity, and data analytics.
- Launch consumer education programs to demystify digital currencies and reinforce trust in digital transactions.

7.3_ Policy Suggestions for Regulators

For a balanced and forward-looking regulatory environment, policymakers should consider:

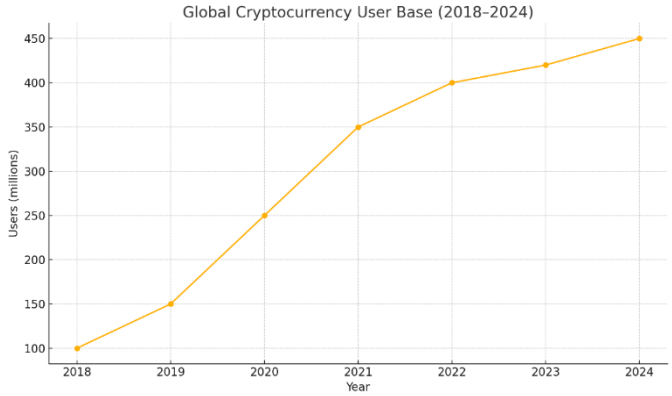
- Developing a harmonized legal framework that distinctly demarcates between digital assets, stablecoins, and CBDCs.
- Providing interoperability with current payment systems such as UPI and Aadhaar.
- Solving privacy, cybersecurity, and grievance redressal mechanisms in digital currency regimes (RBI, 2023).
- Developing regulatory sandboxes to test innovations in a sandbox mode while ensuring systemic stability (NITI Aayog, 2022).

7.4_ Future Research Directions

As digital currency ecosystems mature, future scholarly and policy research should investigate:

- The socio-economic effects of CBDC adoption on financial inclusion across rural and semi-urban India.
- Consumer behavioral research on trust, usage patterns, and preference between cryptocurrencies, UPI, and CBDC.
- Cross-border effects of CBDCs on trade settlement, foreign exchange, and monetary policy independence.
- Quantitative modeling of the effects of CBDC on bank profitability, liquidity, and credit intermediation.

Appendics:



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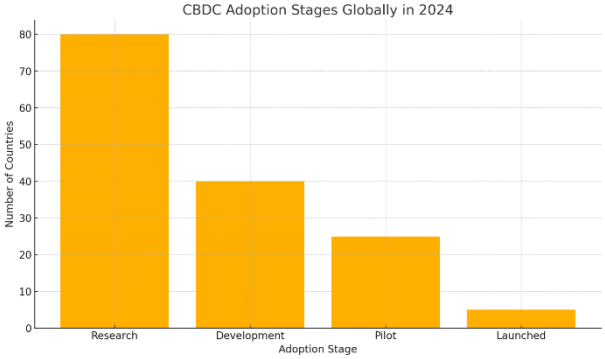

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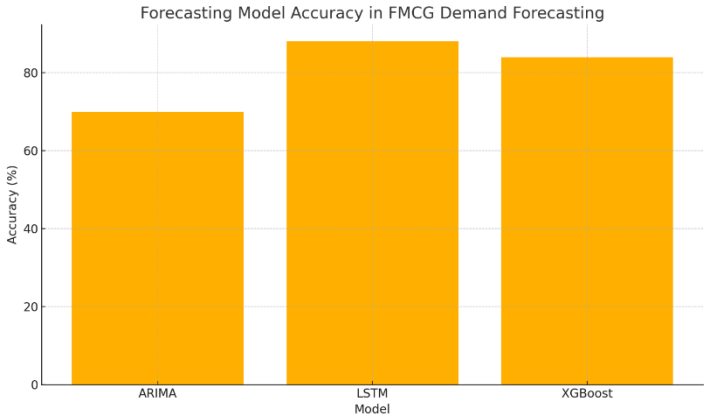

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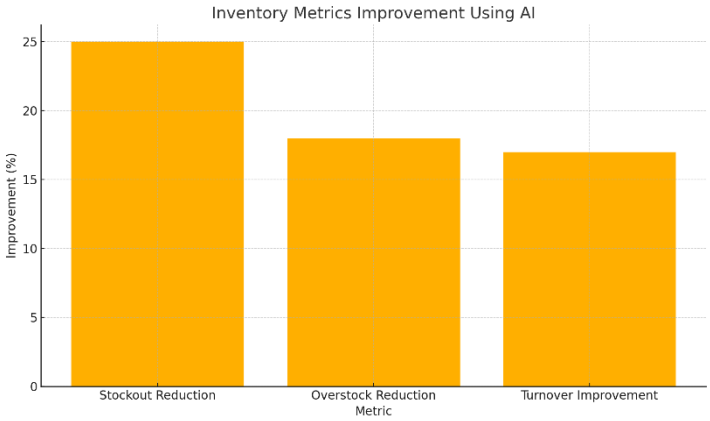

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