# CENTRAL BANK DIGITAL CURRENCY IN INDIA

# CONTENTS

# FOREWORD

Over the last two decades, India’s financial landscape has changed dramatically. Once a cash-reliant economy, it has become a leader in digital payments, thanks to technology, government initiatives, and widespread smartphone use. The next phase in this digital journey is the introduction of Central Bank Digital Currency (CBDC), which aims to make transactions faster, safer, and solve issues existing systems face.

The success of UPI shows India’s readiness for large-scale digital progress. Launched in 2016, UPI has grown rapidly, processing over 15 billion transactions worth ₹20.6 trillion by September 2024. It is now a vital part of India's financial system, enabling quick, secure payments for millions. However, UPI has its limits, especially for cross-border transactions and financial inclusion. This is where CBDC could fill the gaps.

CBDC, issued and regulated by the Reserve Bank of India, is a digital version of the rupee. Unlike cryptocurrencies, which run on decentralized systems, CBDC is backed by the central bank, ensuring stability. One major benefit of CBDC could be its impact on cross-border payments, which are currently slow and costly due to multiple intermediaries. CBDC could simplify and reduce the cost of international transactions, benefiting both individuals and businesses.

Financial inclusion is another area where CBDC could have a significant impact. Despite the success of digital payment platforms like UPI, millions of people in India, particularly in rural and remote areas, still lack access to formal financial services. By offering a digital currency that can be used in areas with limited internet access, CBDC could bring more people into the financial system. This would empower individuals by giving them a safe and convenient way to save, spend, and transfer money, while also contributing to the overall growth of the economy.

However, the introduction of CBDC comes with its own set of challenges. One of the primary concerns is privacy. A digital currency issued by the central bank could allow for greater oversight and monitoring of financial transactions. While this transparency could help combat fraud, money laundering, and other illegal activities, it also raises questions about individual privacy and data security. Striking the right balance between transparency and privacy will be critical to building trust in CBDC. Cybersecurity is another major concern. As a digital asset, CBDC could be vulnerable to hacking, cyberattacks, and fraud. Protecting the CBDC platform from these risks will require robust security measures and ongoing vigilance. The Reserve Bank of India will need to work closely with technology providers, cybersecurity experts, and financial institutions to ensure the security of the digital currency and the broader financial system.

In addition to privacy and security concerns, the introduction of CBDC could have implications for the traditional banking system. If people start holding more of their savings in CBDC wallets rather than traditional bank accounts, it could reduce the availability of funds for banks to lend. This shift could impact banks’ profitability and their ability to provide loans to businesses and individuals, potentially disrupting the financial system. It will be essential for the RBI to design CBDC in a way that complements, rather than competes with, existing banking services. One possible approach could be to encourage the use of CBDC for specific purposes, such as micropayments or cross-border transfers, while maintaining the role of traditional banks in providing loans and other financial services.

This report provides an in-depth look at the opportunities and challenges presented by CBDC, drawing on expert opinions and global trends. It serves as a comprehensive resource for policymakers, financial institutions, and businesses as they prepare for the future of money in India.

**Vedang Vatsa**
**Founder, Hashtag Web3**

# INTRODUCTION

Over the last two decades, India’s payment system has changed significantly, moving from a cash-based economy to one where digital transactions are common. This shift was fueled by advancements in technology, supportive government measures, and the fast growth of the fintech industry. The Unified Payments Interface (UPI) has been at the heart of this change, transforming retail payments by making them quick, safe, and easy for millions of people.

**Growth of Digital Payments in India**

India’s digital payment landscape has grown dramatically, with UPI leading the way since its 2016 launch. By 2026, nearly a billion smartphone users are expected, making mobile the primary financial access tool and bringing unbanked populations into the formal economy.

**Technological and Regulatory Enablers**

Key infrastructures like Aadhaar and UPI have expanded access to digital services, with Aadhaar reaching 1.38 billion IDs by 2024. Initiatives like the Digital India Mission, BharatNet, and the RBI’s Payment Infrastructure Development Fund have further strengthened digital access, especially in underserved areas.

**The Role of Fintech and BigTech**

India's fintech ecosystem has grown rapidly, with $2.6 billion in investments in 2023 alone, driving innovation in digital payments and financial services. BigTech companies like Google and Amazon have also entered the market, collaborating with banks and fintech firms to develop new payment solutions, including Buy Now Pay Later (BNPL) options and co-branded credit cards.

**Central Bank Digital Currency (CBDC) and Future Prospects**

The RBI’s exploration of a Central Bank Digital Currency (CBDC) introduces a promising new phase. The Digital Rupee aims to complement existing systems, reduce cash reliance, lower transaction costs, and improve monetary policy efficiency—marking a significant step in India’s financial evolution.


# HISTORICAL EVOLUTION OF DIGITAL PAYMENTS IN INDIA

**Early Initiatives (1980s-2000s)**

The evolution of digital payments in India can be traced back to the 1980s when banks began adopting Information and Communication Technology (ICT) to automate various banking processes. The Indian Financial Network (INFINET), launched in the late 1980s, was one of the first significant initiatives aimed at creating a secure and efficient communication network for banks and financial institutions. This network laid the foundation for the development of electronic payment systems in the country. The enactment of the IT Act of 2000 was a crucial step in this direction, providing legal recognition to electronic transactions and filings.

**The Impact of ICT on Banking Operations**

The adoption of ICT in banking operations significantly improved the efficiency and accuracy of financial transactions. Automated Teller Machines (ATMs) became widely available, providing customers with easy access to cash and banking services. The introduction of Core Banking Solutions (CBS) enabled banks to centralize their operations, allowing customers to access their accounts from any branch, thus improving convenience and service delivery.

The use of Electronic Clearing Service (ECS) and National Electronic Funds Transfer (NEFT) systems further enhanced the efficiency of payment processing. NEFT, launched in 2005, enabled customers to transfer funds electronically across banks on a batch basis. This system was a significant improvement over the earlier manual processes and marked the beginning of the shift towards electronic payments.

**Key Milestones: NEFT, RTGS, IMPS, and UPI**

The introduction of the National Electronic Funds Transfer (NEFT) system in 2005 was a major step forward from the traditional methods, as it allowed for easier and quicker transactions.

In 2004, the Real-Time Gross Settlement (RTGS) system was launched, allowing for the immediate settlement of high-value interbank transactions. This system reduced settlement risks and enhanced the overall stability of the financial system.

The Immediate Payment Service (IMPS), introduced in 2010, was a game-changer, offering customers 24x7 instant fund transfers across banks via mobile devices and the internet. This innovation laid the groundwork for more advanced digital payment solutions.

The Unified Payments Interface (UPI), launched by the National Payments Corporation of India (NPCI) in 2016, revolutionized digital payments by providing a seamless platform for peer-to-peer (P2P) and person-to-merchant (P2M) transactions. UPI dramatically reduced reliance on cash and made digital payments widely accessible to the broader population.

Since its launch in 2016, UPI has experienced exponential growth, processing a staggering 15,041.75 million transactions worth over ₹20,63,994.71 crore as of September 2024. This surge from just 0.9 million transactions valued at ₹32.64 crore in September 2016 demonstrates UPI's transformative impact on India's payment landscape and its emergence as a global leader in real-time payment systems.

# DIGITAL PUBLIC INFRASTRUCTURE

**The Power of Digital Public Infrastructure**

DPI is a set of shared digital systems that are secure, interoperable, and built on open standards to provide equitable access to public and private services at a societal scale. It is governed by legal frameworks and enabling rules to drive development, inclusion, innovation, trust, and competition, while respecting human rights and fundamental freedoms.

India's experience with DPI showcases its potential. For instance, India has issued over 1.389 billion Aadhaar enrollments, which serve as a foundation for digital identity. The country facilitates more than 10 million daily e-KYC (Know Your Customer) transactions and has enabled over 13 billion Unified Payment Interface (UPI) transactions in April 2024 alone, with a cumulative value of $230 billion. Such scale has been achieved by leveraging technology to bypass traditional development stages, resulting in rapid financial inclusion and economic transformation.

**Global Challenges and DPI Solutions**

The global landscape is marked by challenges like financial exclusion, inadequate access to health services, and the ever-present threat of climate change. Despite significant growth in bank accounts, about 1.4 billion adults, most of them women, remain unbanked. Furthermore, financial resilience is weak, with only 55% of adults in developing countries able to access emergency funds without difficulty within 30 days of an unforeseen expense.

DPI addresses these issues by providing the necessary infrastructure to deliver services at scale. For example, digital financial solutions can help close the credit gap by offering lenders new ways to assess the creditworthiness of potential borrowers. Digital technologies also allow for the efficient transfer of benefits and subsidies directly to those eligible, minimizing diversion of funds and ensuring timely access to necessary resources.

**India Stack**

India Stack is a groundbreaking digital public infrastructure that has reshaped India's economy and holds immense potential for global adoption. It is a comprehensive suite of open-source APIs and digital platforms designed to provide a robust, scalable, and interoperable infrastructure for delivering digital services across various sectors. The core components of India Stack include Aadhaar, Unified Payments Interface (UPI), and Data Empowerment and Protection Architecture (DEPA), each playing a crucial role in transforming how services are delivered and accessed in India.

**The Economic Impact of DPI**

In just eight years, the country has seen tele density rise to 93%, over a billion people obtaining a digital ID document, and over 2 billion digital payment transactions completed per month.

This progress has been driven by DPI initiatives such as the Unified Payments Interface (UPI), which enables instant mobile digital payments, and the Aadhaar Payment Bridge, which facilitated Rs. 3.81 lakh crore cash transfers directly to beneficiaries' bank accounts in 2019-20.

The economic benefits of DPI extend beyond financial inclusion. It has been linked to increases in household income and growing inclusion in credit via small ticket loans. For instance, the gender gap in bank ownership in India has reduced from 18 percentage points to near zero between 2011 and 2021, demonstrating the inclusive potential of DPI.

The JAM Trinity—Jan Dhan, Aadhaar, and Mobile—has created a unified system that ensures every citizen has a bank account, a digital identity, and a mobile phone. This integration has been crucial in expanding financial access and efficiently delivering government benefits directly to recipients, significantly reducing leakages in subsidies and welfare programs.

**Global Adoption and Lessons from India**

The success of DPI hinges on three core pillars: technology design, robust governance, and market participation. These pillars ensure that DPI remains resilient, adaptable, and capable of evolving to meet the needs of the market as it grows to population scale.

Countries worldwide are increasingly recognizing the value of DPI. From Brazil's Pix to Singapore's PayNow and Thailand's PromptPay, nations are leveraging DPI to drive financial inclusion and economic growth. India's experience offers valuable lessons. The country has successfully implemented DPI across various sectors, including identity, payments, and data sharing, resulting in rapid economic transformation and social development.

One of the key takeaways from India’s DPI journey is the importance of government-led initiatives like the Pradhan Mantri Jan Dhan Yojana (PMJDY), which played a critical role in driving financial inclusion. Another is the need for targeted interventions that leverage digital platforms to deliver services efficiently and transparently. The Direct Benefit Transfer (DBT) program in India, which uses the Aadhaar Payment Bridge to deliver benefits directly to individuals, is a prime example of this approach.

# INDIA'S DIGITAL REVOLUTION

**Global Digital Economy Growth**

The global digital economy is growing quickly, currently contributing over 15% to global GDP and expanding 2.5 times faster than the physical economy. India is playing a key role in this trend, with its digital economy contributing 10% to its GDP and expected to reach 20% by 2026. This growth is boosting India's domestic economy and strengthening its position in the global digital landscape.

**Expanding Internet Access**

India's internet access has surged, with a 55% penetration rate in 2023, driven by 199 million new users in three years. The country’s low data costs—₹13.32 per GB, the lowest globally—make internet access affordable. This has led to an average data usage of 24.1 GB per user per month in 2023, emphasizing India’s commitment to building an inclusive digital ecosystem.

**Rise in Smartphone Users**

Smartphones are central to India’s digital expansion, with around 750 million users in 2023, projected to reach 1 billion by 2026. Smartphones are the primary digital access point for many Indians, especially in rural and semi-urban areas, fueling growth in the digital economy.

**FinTech and Digital Payments Growth**

India’s FinTech industry is rapidly expanding, with $2.6 billion in funding in 2023. The UPI has transformed digital payments, handling 80% of all digital transactions in India and reaching a record over 15 billion transactions in Sep 2024 alone, with a total of approximately 134 billion transactions in the 2023-24 fiscal year. Digital payments have grown at a compound annual rate of 50% in transaction volume over the past 7 years, making India a leader in digital payments.

**Financial Inclusion and Jan Dhan Accounts**

India has made major strides in financial inclusion through the Pradhan Mantri Jan Dhan Yojana (PMJDY), which has opened 52.5 crore Aadhaar-linked bank accounts, with over 50% belonging to women and 67% in rural areas. Direct Benefit Transfers (DBTs) ensure government aid directly reaches beneficiaries, minimizing leakage and boosting financial inclusion. In 2023-24, DBTs reached 176 crore beneficiaries, distributing ₹6.9 lakh crore.

**Strengthening Digital Infrastructure**

India has built a robust digital infrastructure, including systems like India Stack, Aadhaar, UPI, and Digilocker. These tools support various services and enhance financial inclusion. The rollout of 5G has significantly improved connectivity, increasing median mobile download speeds from 1.3 Mbps in 2014 to 107.03 Mbps in 2024. BharatNet has connected over 2 lakh rural panchayats, providing access to e-health, e-education, and e-governance services.

**Advancements in Digital Authentication and Lending**

India has streamlined access to services through digital authentication, with over 116 billion Aadhaar-based authentications and 20 billion electronic Know Your Customer (e-KYC) verifications. The digital lending ecosystem is also expanding, with FinTech and BigTech companies collaborating to improve access to credit for individuals and businesses.

**Data Protection and Cybersecurity**

To address privacy concerns, India passed the Digital Personal Data Protection Act (DPDP Act) in 2023, giving users more control over their data. However, cybersecurity challenges are rising with digital expansion, highlighting the need for robust protective measures.

**International Collaboration and Service Exports**

India's Digital Public Infrastructure model is gaining international recognition, with efforts to connect UPI with other countries' payment systems. Digital trade is expected to be a significant contributor to India's GDP by 2030, as India leverages its digital infrastructure to access global markets.

# STATE OF DIGITAL PAYMENTS IN INDIA

**Payment Systems Infrastructure**

India's payment systems infrastructure is among the most advanced in the world, supported by a wide range of digital payment options and services. The country has implemented several payment systems that operate 24x7, including RTGS, NEFT, IMPS, and UPI. These systems are interconnected, allowing for seamless fund transfers across banks and financial institutions.

The Payments Infrastructure Development Fund (PIDF), operationalized by the Reserve Bank of India (RBI) in 2021, has played a crucial role in expanding payment acceptance infrastructure across the country, particularly in rural and semi-urban areas. The PIDF aims to create a robust digital payment ecosystem by providing financial incentives to banks and payment service providers for deploying payment acceptance devices and infrastructure.

**UPI and Its Transformative Impact**

UPI has had a transformative impact on India's digital payment landscape. Launched in 2016, UPI has quickly become the most popular digital payment platform in the country, enabling users to transfer money between bank accounts using a mobile phone. The platform's ease of use, interoperability, and real-time settlement features have contributed to its widespread adoption.

UPI's success can be attributed to its open architecture, which allows multiple banks and fintech companies to offer UPI-based services, fostering competition and innovation. Additionally, the government's push for digital payments, coupled with the widespread availability of smartphones and internet access, has further accelerated UPI's adoption.

UPI has also played a significant role in promoting financial inclusion in India. By enabling users to link their bank accounts with a UPI ID, the platform has made it easier for people, including those in rural areas, to access financial services.

The introduction of UPI 2.0 in 2018 added new features such as overdraft facilities, one-time mandates, and invoice generation, further enhancing the platform's functionality and appeal.

As UPI continues to evolve, it is expected to further cement India's position as a global leader in digital payments, setting benchmarks for other nations to follow.

**Role of Government Initiatives**

Several government initiatives have been instrumental in building the necessary infrastructure, raising awareness, and incentivizing the use of digital payments.

The Pradhan Mantri Jan-Dhan Yojana (PMJDY), launched in 2014, aimed to provide universal access to banking facilities by opening bank accounts for the unbanked population. As of 2023, over 450 million PMJDY accounts had been opened, with a significant portion of these accounts linked to digital payment platforms like UPI.

The Direct Benefit Transfer (DBT) scheme, which channels subsidies and welfare payments directly into beneficiaries' bank accounts, has also played a crucial role in promoting digital payments.

The Digital India Mission, launched in 2015, aimed to transform India into a digitally empowered society and knowledge economy. As part of this mission, the government has implemented various initiatives to promote digital literacy, improve internet connectivity, and encourage the use of digital payments.

**Key Players in the Digital Payment Ecosystem**

The digital payment ecosystem in India is characterized by a diverse range of players, including banks, payment gateways, fintech companies, and third-party service providers (TPSPs). These players have developed a wide array of digital payment solutions, catering to the diverse needs of consumers and businesses. Banks have been at the forefront of the digital payment revolution in India, offering internet banking, mobile banking, and card-based payment solutions. Payment gateways like Paytm, PhonePe, and Google Pay have also gained significant traction, offering easy-to-use platforms for online and mobile payments. Fintech companies have played a crucial role in driving innovation, and developing new payment solutions such as digital wallets, Buy Now Pay Later (BNPL) services, and contactless payment options.

The National Payments Corporation of India (NPCI) has been instrumental in developing and managing the country's digital payment infrastructure. NPCI's platforms, including UPI, IMPS, and Aadhaar Enabled Payment System (AePS), have become the backbone of India's digital payment ecosystem, enabling secure and efficient transactions across the country. Building on the success of these platforms, the concept of Central Bank Digital Currency has emerged as the next frontier in the evolution of digital payments.

# THE CONCEPT OF CBDC

Central Bank Digital Currency (CBDC) is a digital form of a country's fiat currency, issued and regulated by the central bank. Unlike cryptocurrencies, which operate on decentralized networks and are not backed by any central authority, CBDCs are centralized and represent a direct claim on the central bank.

CBDCs can be designed for various use cases, including retail payments (for use by the general public) and wholesale payments (for use by financial institutions). The design and implementation of CBDCs vary from country to country, depending on the specific goals and requirements of the central bank.

In the traditional financial system, when you have physical cash, like bills and coins, that is considered the currency issued by the central bank. With a CBDC, the central bank creates a digital version of that currency that can be used for transactions and payments, just like you would use physical cash or a debit/credit card.

When you hold a CBDC, you essentially have a direct claim on the central bank, just like when you hold physical cash. The central bank is responsible for issuing the CBDC and maintaining its value, similar to how they manage the paper currency.

For consumers, it offers a convenient way to make payments, similar to using mobile payment apps or credit cards, but with the added security of being backed by the central bank. For businesses, CBDCs can streamline payment processes, reduce transaction costs, and minimize the risks associated with handling large amounts of cash. Governments can also benefit by gaining more efficient means of distributing funds, such as in the case of welfare payments, and by having better control over the money supply.

Central Bank Digital Currencies (CBDCs) can take on various forms, each tailored to meet specific objectives within a nation's financial system. These forms differ primarily in their intended use cases, the parties involved in their distribution, and the underlying infrastructure needed to support them. Below is a more detailed exploration of each type of CBDC.

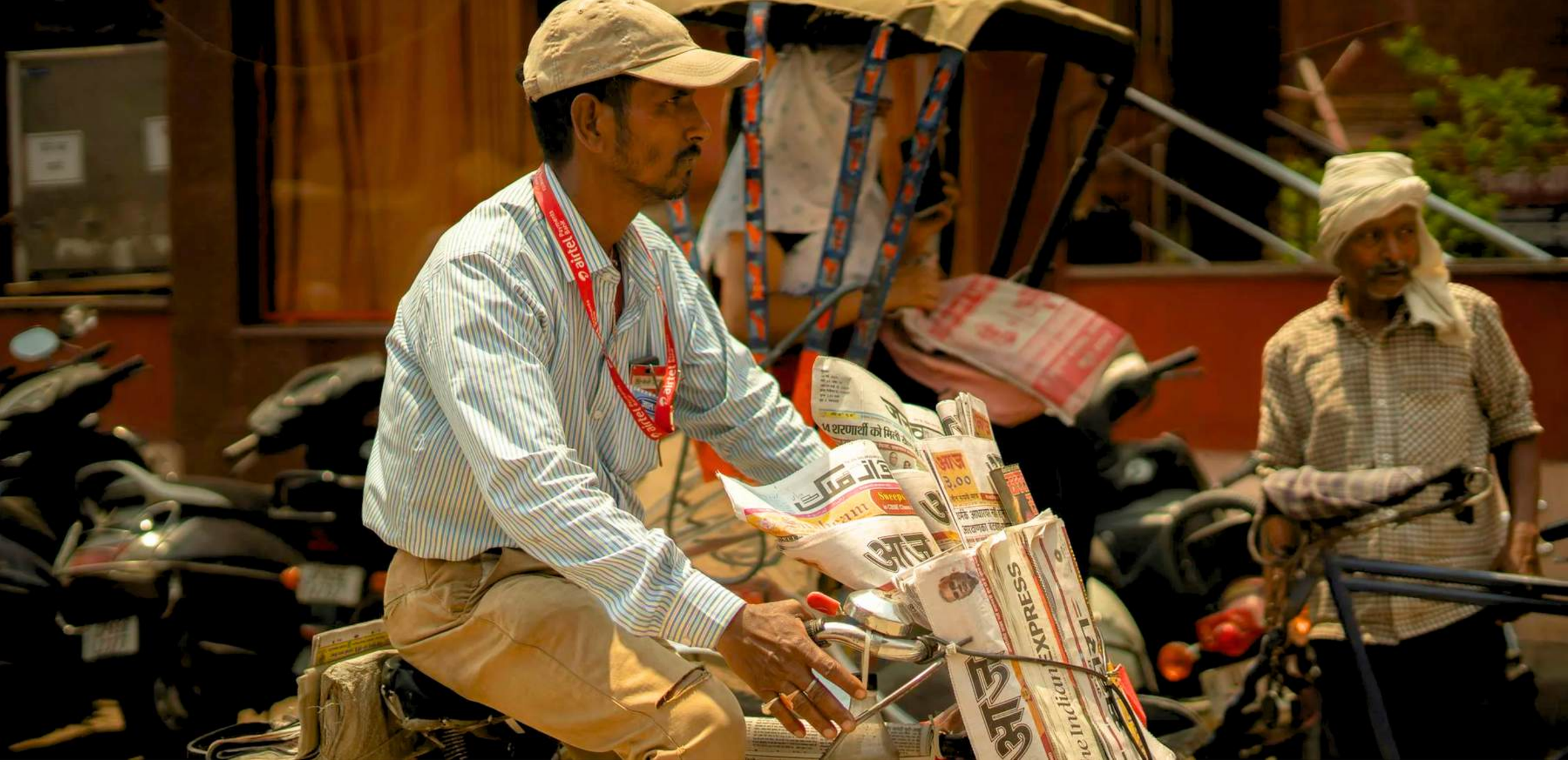
**Retail CBDC**: Designed for the general public, similar to physical cash, to provide a digital alternative for everyday transactions. Accessible through digital wallets, with the goal of improving financial inclusion and offering a secure, convenient, and efficient digital payment option.

**Wholesale CBDC:** Designed for financial institutions to facilitate high-value, interbank settlements and transactions. Can improve the efficiency and speed of interbank settlements, potentially reducing the need for intermediaries and associated costs.

**Hybrid CBDC**: Combines elements of retail and wholesale CBDCs, allowing use by both the general public and financial institutions. Can provide the benefits of improved financial inclusion and efficient interbank settlements, but the design and implementation can be more complex.

**Indirect CBDC**: The central bank issues the CBDC, but it is distributed and managed through intermediaries, such as commercial banks. Can leverage the existing financial system and infrastructure, but may raise privacy concerns due to intermediary involvement.

**Direct CBDC**: The central bank provides CBDC accounts and digital wallets directly to the public, without intermediaries. Can offer greater privacy and control, but may require significant investment and infrastructure development by the central bank.




# CHALLENGES

**Cybersecurity and Privacy Concerns**

The implementation of CBDC raises several cybersecurity and privacy concerns that need to be addressed to ensure the safety and integrity of the Digital Rupee. As a digital currency, the Digital Rupee is vulnerable to cyberattacks, hacking, and data breaches. Ensuring the security of the CBDC platform is critical to prevent unauthorized access, fraud, and theft.

There are also concerns about the potential for surveillance and privacy violations with the use of CBDC. As a centralized digital currency, the Digital Rupee could allow the government or central bank to monitor and track transactions, raising concerns about privacy and individual freedoms. Balancing the need for security and transparency with the protection of user privacy will be a key challenge in the implementation of CBDC.

**Impact on Traditional Banking System**

The introduction of CBDC has the potential to disrupt the traditional banking system, particularly if it leads to a significant shift away from bank deposits to digital currency holdings. This could reduce the availability of funds for banks to lend, impacting their profitability and stability.

There are also concerns about the potential disintermediation of banks, as CBDC could reduce the need for traditional banking services, such as payment processing, money transfers, and lending. Ensuring that the implementation of CBDC is done in a way that complements, rather than competes with, the traditional banking system will be critical to maintaining financial stability.

**Regulatory and Policy Considerations**

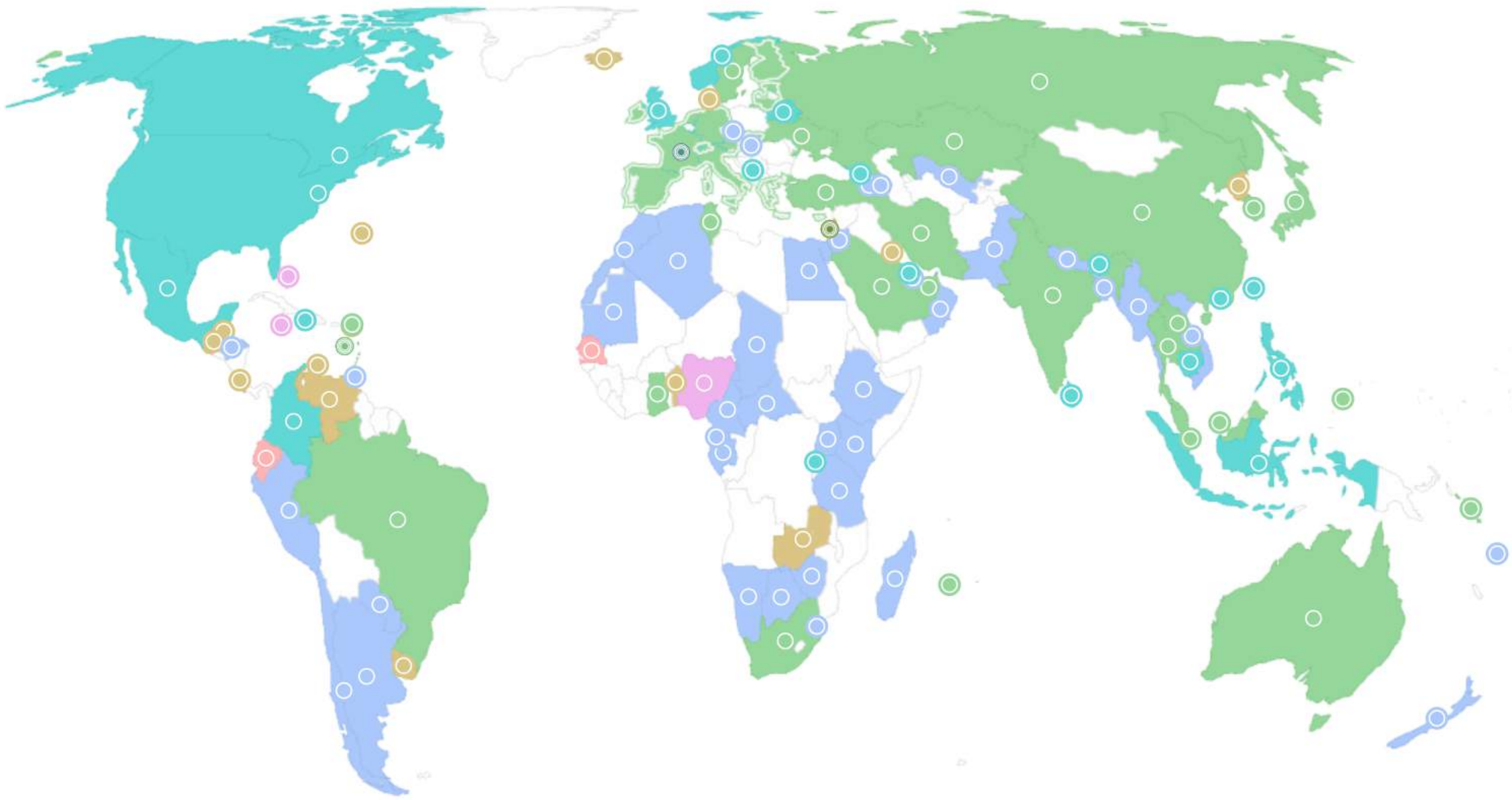
The implementation of CBDC will require a comprehensive regulatory and policy framework to ensure its safe and effective use. This includes establishing clear guidelines on the issuance, distribution, and use of the Digital Rupee, as well as addressing issues related to consumer protection, data privacy, and cybersecurity.

There are also concerns about the potential impact of CBDC on monetary policy and financial stability. The central bank will need to carefully manage the supply and demand of the Digital Rupee to prevent inflation or deflation, and ensure that the introduction of CBDC does not disrupt the broader financial system.

**Balancing Financial Stability with Innovation**

The implementation of CBDC presents a challenge in balancing the need for financial stability with the desire for innovation. While CBDC has the potential to enhance the efficiency and inclusivity of the financial system, it also carries risks that need to be carefully managed.

Ensuring that the implementation of CBDC is done in a way that promotes innovation while maintaining financial stability will require close coordination between the central bank, government, and other stakeholders. This includes conducting thorough risk assessments, implementing robust regulatory frameworks, and continuously monitoring the impact of CBDC on the broader financial system.



# GLOBAL TRENDS

**Increased Exploration:**

- As of May 2024, 134 countries and currency unions are actively exploring Central Bank Digital Currencies (CBDCs), covering 98% of global GDP. This marks a significant increase from 35 countries in May 2020.

**Advanced Development:**

- **Status**: 68 countries have moved beyond initial exploration to advanced stages of CBDC development, which includes piloting or launching digital currencies.
- **Examples**: This includes countries like Brazil, India, and Australia, which are testing or have partially rolled out their digital currencies.

**G20 Engagement:**

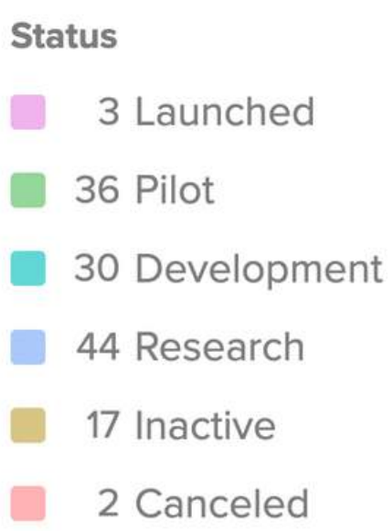
- **Involvement**: Out of 20 G20 countries, 19 are actively exploring CBDCs. Eleven of these are in the pilot stage.
- **Key Players**: Major economies such as Brazil, Japan, and China are leading in the development and testing of CBDCs, highlighting their strategic importance.

**Fully Launched CBDCs:**

- **Current Launches**: The Bahamas, Jamaica, and Nigeria have fully implemented their CBDCs, with operational systems for everyday transactions.
- **Issues**: The Eastern Caribbean Currency Union's DCash faced technical difficulties leading to a temporary halt and a reevaluation of its implementation strategy.

**Growing Number of Pilots:**

- **Ongoing Trials**: There are currently 36 active CBDC pilot programs globally, with notable projects including the digital euro, which is in a two-year preparation phase set to conclude in 2025.
- **Focus**: These pilots aim to test various use cases and integration with existing financial systems to gauge feasibility and effectiveness.




In most countries with advanced CBDC projects, the digital currencies are intermediated, meaning they are distributed through banks, financial institutions, and payment service providers.

However, China's digital yuan (e-CNY) also has an option for direct CBDC access, where users can access the currency directly through a central bank app. China's digital yuan (e-CNY) is the world's largest CBDC pilot, with 260 million wallets across 25 cities. Since 2022, it has been used in a range of settings, from public transportation to healthcare and even for buying crude oil. In 2024, the pilot is focused on optimizing the e-CNY for use by overseas tourists and expanding its cross-border applications.

The BRICS countries (Brazil, Russia, India, China, and South Africa) are all in the pilot phase of CBDC exploration, and are also collaborating on developing an alternate payments system to the US dollar.

Since Russia's invasion of Ukraine and the resulting sanctions, there has been a surge in the development of cross-border wholesale CBDC projects. These allow for the transfer of digital currencies between countries.

One example is the mBridge project, which connects China, Thailand, the United Arab Emirates, and Hong Kong. This project will expand to 11 more countries in 2024.

# GLOBAL TRENDS

Central Bank Digital Currencies are rapidly moving from concept to reality, with central banks worldwide accelerating research, piloting, and development. These digital currencies are being explored for various reasons, from enhancing financial inclusion to modernizing financial infrastructures. Here's an overview of the key trends driving CBDC development globally:

**1. Rapid Adoption and Expansion**
Many countries, both advanced and emerging, are piloting or considering CBDC programs. This surge reflects a global push to modernize payment systems and ensure readiness for a digital financial future.

**2. Financial Inclusion**
Emerging markets see CBDCs as tools for financial inclusion, aiming to provide digital financial access to unbanked populations. By offering an accessible digital currency, central banks hope to bridge gaps in financial services.

**3. Technological Advancements**
CBDCs are accelerating innovation in distributed ledger technologies (DLTs). Central banks are experimenting with various frameworks to develop secure, scalable, and efficient digital currencies.

**4. Wholesale vs. Retail Models**
CBDCs are being developed in two main models: retail CBDCs, which target the general public, and wholesale CBDCs, which facilitate interbank transfers. Each model addresses different needs and presents unique challenges.

**5. Interoperability and Cross-Border Payments**
A key focus is making CBDCs interoperable with existing financial systems and enhancing cross-border payment efficiency. By reducing the cost and friction in international transactions, CBDCs could reshape global payments.

**6. Regulatory and Privacy Challenges**
As CBDCs progress, regulatory frameworks are evolving to address privacy, security, and anti-money laundering (AML) requirements. Privacy, particularly for retail CBDCs, is a critical consideration, balancing transparency with individual rights.

**7. Private Sector Collaboration and Public-Private Partnerships**
Central banks are increasingly partnering with private technology firms and financial institutions. Public-private partnerships are leveraging private sector innovation and expertise to develop CBDCs tailored to specific financial ecosystems.

**8. Geopolitical and Economic Resilience**
Some nations see CBDCs as a way to assert monetary sovereignty and reduce dependence on foreign currencies. Additionally, CBDCs offer a resilient financial tool that can maintain stability in times of crisis.

**9. Environmental Impact and Energy Efficiency**
Amid rising concerns about environmental sustainability, central banks are exploring energy-efficient technologies for CBDC operations to minimize environmental impact.

**10. Digital Identity Integration and Economic Policy**
Several CBDC projects are examining the potential integration of digital identities to facilitate secure transactions. The deployment of CBDCs also opens new possibilities for central banks to influence monetary policy directly, potentially impacting money supply and interest rates.

**11. Long-Term Strategy and Public Engagement**
Countries are approaching CBDC development with a long-term, cautious approach, focusing on scalability and public feedback. Many central banks are engaging with stakeholders to ensure that CBDCs align with societal needs and expectations.

# INDIA'S APPROACH

**Wholesale CBDC and Retail CBDC**

- The implementation of CBDC in India began with the launch of pilot programs for both wholesale (CBDC-W) and retail (CBDC-R) use cases.
  - The pilot programs were designed to test the technical and operational aspects of the CBDC, as well as to assess its impact on the broader financial system.
- The wholesale CBDC (CBDC-W) pilot focused on the use of the Digital Rupee for large-value interbank transactions and settlement of government securities.
  - This pilot aimed to enhance the efficiency of the financial markets by providing a real-time, secure, and cost-effective settlement mechanism.
  - The wholesale CBDC pilot was conducted in collaboration with select banks and financial institutions, which participated in the program to assess the benefits and challenges of using the Digital Rupee for wholesale transactions.

- The retail CBDC (CBDC-R) pilot, on the other hand, focused on the use of the Digital Rupee for everyday transactions by the general public.
  - This pilot aimed to test the usability and adoption of the Digital Rupee among consumers and merchants.
  - The retail CBDC pilot was conducted in collaboration with select banks, fintech companies, and merchants, who participated in the program to assess the benefits and challenges of using the Digital Rupee for retail payments.

The pilots have offered key insights into frameworks essential for full-scale CBDC deployment and future policy refinement.

As of June 2024, India's retail CBDC pilot has shown promising results, with over 5 million users and 420,000 merchants participating nationwide.

User feedback from the pilot program has highlighted the convenience and speed of transactions using the Digital Rupee, with many users expressing satisfaction with the ease of use and the ability to conduct transactions without the need for physical cash. The offline functionality of the Digital Rupee has also been well-received, particularly in areas with limited internet connectivity.

Merchants participating in the pilot program have reported a positive experience with the Digital Rupee, citing the benefits of reduced transaction costs, faster settlement times, and the ability to attract new customers who prefer digital payments. The pilot program has also revealed some challenges, such as the need for greater awareness and education among users and merchants, as well as the need to address cybersecurity concerns.

**Comparison with Global CBDC Initiatives**

India's approach to CBDC is consistent with global trends, with several countries exploring or piloting their own digital currencies. The Chinese Digital Yuan, for example, has been widely tested across multiple cities, with millions of users participating in pilot programs. China's CBDC initiative has focused on retail payments, with a particular emphasis on integrating the Digital Yuan with existing payment platforms like Alipay and WeChat Pay.

Sweden's e-Krona pilot has focused on both retail and wholesale use cases, with a particular emphasis on testing the technical and operational aspects of the CBDC. The e-Krona pilot has also explored the potential for cross-border payments, with the aim of enhancing the efficiency and speed of international transactions.

The Bahamas' Sand Dollar, one of the first CBDCs to be fully implemented, has focused on promoting financial inclusion and providing a secure and efficient payment option for the country's residents.

# POLICY IMPLICATIONS

The introduction of CBDCs in India is a significant step towards modernizing the monetary system. However, it must be done with caution, considering the potential risks and ensuring that the design and implementation are aligned with public policy objectives.

**Monetary Policy and Financial Stability**

One of the primary concerns with CBDCs is their potential impact on monetary policy and financial stability. If a CBDC is widely accessible and non-remunerated (i.e., it does not pay interest), it may act as a close substitute for physical cash. However, during periods of financial instability, there could be a rapid shift from bank deposits to CBDCs, exacerbating bank runs. This would weaken banks' ability to lend, potentially leading to a credit crunch, which could dampen economic activity and make monetary policy less effective.

On the other hand, if the CBDC is remunerated (i.e., it pays interest), it could enhance the transmission of monetary policy by directly influencing economic agents' behavior. However, this could also lead to disintermediation of banks, where individuals and businesses move their deposits from banks to the central bank, potentially increasing the cost of funding for banks and disrupting their role in financial intermediation.

**Liquidity Management**

The introduction of a CBDC would also have implications for liquidity management. CBDCs, like physical currency, would be an autonomous source of system-wide liquidity change. If a CBDC leads to a significant shift from bank deposits to central bank money, it could reduce the reserves available to commercial banks, requiring the central bank to inject liquidity into the system more frequently. This could expand the central bank's balance sheet and alter the dynamics of liquidity management, necessitating adjustments in the operational framework of monetary policy.

**Legal and Regulatory Considerations**

Legally, the introduction of a CBDC requires a robust framework that ensures the central bank has the authority to issue digital currency. In India, this has already been addressed through amendments to the Reserve Bank of India Act, 1934. However, further legal considerations include defining the legal tender status of CBDCs, ensuring consumer protection, and addressing privacy and data protection issues. The design of the CBDC—whether it is account-based or token-based—will determine its legal implications and the necessary amendments to existing laws.

**Financial Inclusion and Competition**

CBDCs hold the promise of enhancing financial inclusion by providing a safe, digital form of central bank money that is accessible to all, including those in remote areas without internet connectivity. The offline functionality of CBDCs would be crucial in this regard. Moreover, CBDCs could promote competition and innovation in the payment system by offering an additional payment method that could coexist with and complement existing digital payment systems like UPI. However, the introduction of a CBDC must not stifle private sector innovation but rather foster a competitive environment that benefits consumers.

**Cross-Border Payments**

CBDCs could potentially revolutionize cross-border payments by making them faster, cheaper, and more transparent. By enabling direct transfers between CBDCs of different countries, it could reduce the need for intermediaries, thereby lowering costs and enhancing efficiency. However, achieving this would require international cooperation and the establishment of common standards to ensure interoperability between different CBDC systems.

# FUTURE PROSPECTS OF DIGITAL PAYMENTS AND CBDC IN INDIA

**Projected Growth of Digital Payments**

The government's focus on promoting digital payments, along with the increasing availability of smartphones and internet access, is expected to further accelerate the growth of digital payments in the country. By 2025, it is projected that digital payments will account for over 80% of all transactions in India, with UPI remaining the dominant platform.

The growth of digital payments is also expected to be supported by the development of new payment solutions and technologies, such as contactless payments, QR codes, and biometric authentication. These innovations will provide consumers with more options for making payments and managing their finances, further driving the adoption of digital payment methods.

**Potential for Full-Scale CBDC Implementation**

The successful implementation of the pilot programs for the Digital Rupee has paved the way for the potential full-scale implementation of CBDC in India. The lessons learned from the pilot programs will be critical in shaping the future of the Digital Rupee, including its design, distribution, and use cases.

The full-scale implementation of CBDC has the potential to revolutionize the financial landscape in India, offering new opportunities for innovation, financial inclusion, and economic growth. The Digital Rupee could become a key component of India's digital economy, providing a secure, cost-effective, and accessible digital currency option for all citizens.

However, the full-scale implementation of CBDC will require careful planning and coordination between the central bank, government, and other stakeholders. This includes addressing the challenges and risks associated with CBDC, as well as ensuring that the Digital Rupee is designed in a way that meets the needs of all users, including the unbanked and underserved populations.

**Role of Government and Regulatory Bodies**

The government and regulatory bodies will play a critical role in the future of digital payments and CBDC in India. The government's commitment to promoting digital payments and financial inclusion will be key to driving the continued growth of the digital payment ecosystem.

The Reserve Bank of India (RBI) will also play a central role in the development and implementation of CBDC, ensuring that the Digital Rupee is designed and regulated in a way that promotes financial stability, security, and innovation.

The RBI will need to work closely with other stakeholders, including banks, fintech companies, and consumers, to ensure the successful implementation of CBDC.

The development of a comprehensive regulatory and policy framework will be critical to the future of digital payments and CBDC in India. This includes establishing clear guidelines on the use of digital payments and CBDC, as well as addressing issues related to consumer protection, data privacy, and cybersecurity.

# INDUSTRY OPINION

## Jose Antony
### Founder, The Crypto Cooperative

Central Bank Digital Currencies in India face several key challenges that will determine their success. Privacy concerns are paramount, requiring robust measures to protect user data. Additionally, CBDCs must either offer clear advantages over or integrate seamlessly with the widely used UPI to gain traction. Leveraging blockchain technology with Zero-Knowledge Proof could address privacy issues while enhancing transparency. Allowing banks to issue their own CBDCs with unique features could add value and flexibility. However, international adoption might be hindered by privacy concerns and regulatory barriers, such as restrictions imposed by the US Congress.

## Preetam Rao
### CEO, QuillAudits

Digital Public Infrastructure (DPI) plays a key role in the adoption of Central Bank Digital Currencies (CBDCs), providing a secure, interoperable base that works smoothly with current financial technologies.

Beyond enabling transactions, DPI can boost financial inclusion, especially in developing countries, by making stable financial systems accessible. However, challenges like the digital divide, data privacy, and moving from cash-based economies need to be tackled to ensure fair access for all.

DPI also opens the door for innovative features like programmable money through smart contracts, potentially changing how transactions are done. Global cooperation and standard rules are essential to ensure DPI and CBDCs support a more connected and inclusive global economy.

## Arjun Vijay
### Co-Founder, Giottus Crypto Exchange

At this point in time, CBDC for retail is competing against UPI. Users don't find a need to move away from UPI as there are no incentives for using CBDC, nor are there any significant pain points. I’m not seeing much adoption on the corporate side either, as we already have a rich infrastructure. However, these things can change if we introduce the smart contracts and programmability aspects. For example, salaries could be streamed, project finance loans could be paid directly, and subsidies could be restricted for specific purposes only. But we are still in the early stages.

The network effect is also very important. Right now, the most significant advantage of UPI is its integration with our bank accounts. However, the e-rupee is standalone, requiring users to load money separately. I assume that existing UPI QR codes can be used to accept e-rupee payments, and interoperability could be a game changer. CBDC is ideal for cross-border transfers like remittances because there is a lot of inefficiency in the current processes.

## Sambhav Jain
### CEO, Intract

Exploring a CBDC in India requires a careful balance between innovation and regulation. Key considerations include its potential impact on financial inclusion, alignment with the global adoption of digital currencies, safeguarding user privacy, integration with the existing banking system, and supporting the future evolution of global commerce. A well-rounded approach will ensure that India’s CBDC initiative benefits the economy while addressing security and operational challenges.

# INDUSTRY OPINION

## Ashwin Nandapurkar

### Chief Blockchain Officer, EX-Fusion

I think CBDCs are a double-edged sword in general. In India, implementing CDBC on the one hand has the potential to bring in a large number of benefits by enhancing financial inclusion, improving the efficiency of the monetary/ banking system, and potentially improving international trade using the e-rupee.

On the other hand, there are multiple challenges like infrastructure and cybersecurity requirements for the implementation of new technology in the whole country; the potential for erosion of privacy, surveillance and targeting by authorities; and non-interoperability of e-rupee with other global CBDCs. I am cautiously optimistic about the e-rupee.

## Rohas Nagpal

### Chief Blockchain Architect, HYFI Blockchain

While CBDCs provide some benefits for a nation like India, they can also lead to some unintended consequences. The transparency & traceability of CBDC transactions will increase the shadow economy by driving economic activities underground.

Many businesses and even individuals would want to avoid the regulatory oversight that comes with CBDCs. They would prefer using Bitcoin & stablecoins.

A cyberattack on the central bank would have catastrophic effects on the entire economy if all digital transactions are centralized through CBDC.

## Suraj Sharma

### Head of Public Policy, Onramp.money

India’s digital financial landscape has evolved rapidly, with UPI demonstrating the nation’s ability to adopt large-scale digital innovation. The launch of Central Bank Digital Currency marks the next step, with the digital rupee pilot laying the groundwork for a new era in digital finance, though it hasn’t yet matched UPI’s initial impact. This initiative underscores the Reserve Bank of India’s commitment to enhancing financial inclusion, efficiency, and security.

As CBDCs transition from pilot phases to broader adoption, integrating them with onramp and offramp services will be essential to create a seamless and compliant ecosystem. Such integration simplifies digital-to-fiat conversions, encouraging adoption and bridging digital assets with traditional finance through enhanced regulatory oversight. This setup is vital for fostering a secure and user-friendly experience, which can build confidence in digital transactions and accelerate the adoption of CBDCs across India.

Onramp.money views this alignment as a key component of a connected financial system. Collaboration among regulators, financial institutions, and the Web3 community is also crucial to driving the next wave of financial innovation, as the synergy between CBDCs and Web3 technologies has the potential to reshape India’s digital economy.

By establishing a robust, user-centric infrastructure, CBDCs can contribute to a resilient and inclusive digital financial ecosystem that benefits all Indians, setting a strong foundation for future advancements in the financial sector.

This shift aims to bring more people into the formal financial system, helping drive economic growth and digital access for everyone. As CBDCs grow, clear communication with the public and open policies will be important to build trust and encourage widespread use.

# INDUSTRY OPINION

## Chintan Oza

### Founder, Anantam Ecosystems

The global payments landscape is undergoing a vibrant transformation, fueled by the collective desire for real time, seamless, and accessible financial transactions. Real-time payments are rapidly becoming the norm, empowering individuals and businesses across the globe with unprecedented speed and convenience. India's UPI is a shining example of inclusive innovation, having democratized mobile payments and fostered financial inclusion and economic growth.

The exploration of Central Bank Digital Currencies by over 100 countries signals a bold step toward a more efficient and equitable financial system, opening doors to new opportunities for all. In the next three years, we can expect real-time payments to become ubiquitous, transcending borders and fostering greater connectivity among nations. Cross-border transactions will become faster, more affordable, and transparent, facilitating trade and collaboration across the G20 and BRICS plus member countries.

The convergence of payments and data will unlock a world of personalized financial services, empowering individuals and businesses to make informed decisions and achieve their goals. India's Digital Public Infrastructure stack, a testament to the power of open innovation, will continue enabling countries to build their own inclusive payment systems. This presents a unique opportunity for Indian enterprises to showcase their tech prowess on the global stage, driving tech diplomacy and forging mutually beneficial partnerships.

The future of payments is brimming with hope and opportunity, driven by collaboration, technological advancements, and a shared commitment to building a more inclusive and prosperous world. As real-time payments, UPI, CBDCs, and other emerging technologies converge, we stand on the cusp of a financial revolution that will empower individuals, businesses, and nations alike. The G20 and BRICS plus member countries have a unique opportunity to lead this transformation, fostering economic growth, financial inclusion, and shared prosperity for all.

## Monica Jasuja

### Global Payments and Product Strategy Advisor

India's growing digital consumer base, while expanding rapidly, still represents only a fraction of the overall population. With approximately 1 in 3 individuals utilizing digital payments (primarily through UPI), there exists a significant opportunity to reduce India's reliance on cash as the primary medium for transactions and shift towards a more digital-first payment infrastructure. Despite India’s global leadership in digital payments—accounting for 46% of the world’s digital transactions—the value of these transactions remains relatively low, with UPI being predominantly viewed as a cash replacement for low-value, daily use cases.

CBDCs will not compete with existing digital payment systems but will enhance India’s ability to cater to a diverse range of financial needs. UPI currently caters to a tax-filing populace that is comfortable with their digital footprints being visible to the government. Yet, the untapped potential for growth lies in the millions within rural India ('Bharat') who are now entering the digital fold, albeit with limited per capita income. For many in this segment, while they have access to financial services through initiatives like Jan Dhan accounts, the key to driving adoption of digital payments lies in improving their income levels. Retail CBDCs can play a transformative role here. The RBI has emphasized that the rollout of CBDC-R will be executed with meticulous oversight to ensure that the broader monetary system remains unaffected. Unlike UPI or other digital payment solutions, CBDCs are not intended to compete but to complement these systems, offering government-controlled, cost-efficient alternatives that cater to specific use cases.

Moreover, a critical challenge lies in expanding the tax base by encouraging more people to participate in the formal economy. Many individuals remain hesitant to adopt digital payments due to fears of increased tax scrutiny, thereby perpetuating the grey economy. Even a modest shift from cash to digital transactions could significantly enhance India’s tax revenues, which in turn would contribute to GDP growth and support the government’s vision of achieving a $5 trillion economy.

# INDUSTRY OPINION

## Rahul Mudgal
### Consultant

It is good to draw parallels from other parts of the world in the context, and in this case from another BRICS economy – Brazil. While India's CBDC pilot has focused on enhancing transaction efficiency and monetary policy control compared with UPI, Brazil's DREX initiative aspires to leverage both retail and wholesale CBDCs as instruments of financial inclusion. A wholesale CBDC can unlock greater efficiency in the banking and the capital markets ecosystem by making interbank settlements more efficient and responsive to dynamic market conditions and macro factors. Hopefully, we will see some pilots in India in a similar direction.

## Akshay Sharma
### Global Listings and Business Lead, XT

The implementation of Central Bank Digital Currencies offers significant advantages, particularly in combating black money through enhanced traceability. If integrated with blockchain technology, CBDCs could unlock a range of applications that further strengthen transparency and efficiency in financial transactions. However, it is essential to consider the balance of power this may afford governments.

While increased control could lead to better regulation and oversight, it also raises concerns about the potential for overreach, where individuals might feel hesitant to express dissenting views due to fear of financial repercussions. The challenge lies in finding a middle ground that maximizes the benefits of CBDCs while safeguarding the financial autonomy and freedom of citizens.

## Saravanan Pandian
### CEO, KoinBX

The introduction of CBDCs by central banks worldwide signifies not just a new chapter in the monetary system, but a fundamental shift towards a more inclusive, efficient, and secure financial landscape.

The Launch of CBDC will start a revolution towards faster settlements and transaction across the globe irrespective of boundaries and time just like a domestic transfers.

At KoinBX, our mission has always been to democratize access to digital assets and empower individuals across the globe. In our eyes, CBDCs aligns perfectly with this vision. By enabling direct access to central bank money in digital form, CBDCs have the potential to revolutionize how we transact, save, and invest.

One of the most compelling advantages of CBDCs is the enhancement of financial inclusion. In regions where access to traditional banking services remains limited, CBDCs can provide an accessible, secure, and cost-effective alternative. By leveraging digital wallets, individuals in underbanked or remote areas can participate in the formal economy, fostering greater financial inclusion and economic growth.

Moreover, CBDCs offer unparalleled transparency and security. With blockchain or distributed ledger technology at their core, CBDCs can provide real-time tracking of transactions, reducing the risks associated with fraud and money laundering. This level of transparency is crucial for building trust in the financial system, especially in times of economic uncertainty.

From a macroeconomic perspective, CBDCs present a unique opportunity for central banks to enhance monetary policy effectiveness. By having greater control over the money supply and the ability to implement targeted interventions, central banks can respond more swiftly and precisely to economic challenges, ensuring stability and growth.

# INDUSTRY OPINION

## Srijan R Shetty
### Co-founder, Fuze

In the Indian context, a CBDC provides an incredible opportunity to directly address the low financial inclusion. Direct benefits can be transferred to those who need it, without leakages that happen through conventional channels of distribution of funds. Additionally new avenues of on-chain financing can be open to Indians who usually had to resort to predatory capital leading to more competitive loans to those who need it to the most. There is one area though, where CBDCs can prove to be a double edged sword - privacy. By definition they are not private and anyone can trace CBDCs on-chain. On one hand, this reduces the shadow economy, leading to better tax efficiency and a growth in GDP; on the other it raises privacy concerns over allowing people to use their hard earned money in a way that isn't paternalistic. This is an issue that needs to be addressed with nuance. One great aspect of an Indian CBDC is the India Stack, which allows Indians to enjoy the on-chain economy with social recovery and no fear of losing their keys.

Finally, in the larger trend of de-dollarization, a CBDC from a neutral country like India can provide for a fertile ground for innovation and faster cross border settlements replacing outmoded systems like SWIFT which lack traceability & modern tooling.

## Saurabh Kumar
### VP Growth, Mudrex

CBDC are a great way for govt to track, measure, and improve it's own expenditure to begin with, CBDC can potentially enable a more efficient subsidy distribution mechanism, where the digital rupee can have micro capital controls and can be used for spending for certain goods and services from certain whitelisted vendors only, this has the potential to eliminate a lot of middlemen corruption

## Dileep Seinberg
### Founder, MuffinPay

Financial inclusion is a critical aspect of economic development, particularly in a country like India, where millions remain unbanked or underbanked. Despite significant advancements in banking infrastructure, a large segment of the population continues to face barriers to accessing financial services, whether due to geographic isolation, lack of proper documentation, or economic constraints. The introduction of CBDC can mitigate these challenges by providing a digital means of transacting that is accessible to all, regardless of location or economic status.

Currently, many Indians, particularly those in rural areas, are excluded from participating in international trade and commerce due to the limitations of the existing banking infrastructure. Even those with bank accounts often find it challenging to engage in cross-border transactions due to high fees, slow processing times, and the complexities of foreign exchange. A CBDC could streamline these processes, allowing for quicker, more cost-effective transactions that would enable Indian consumers and businesses to engage with global markets more efficiently.

The implications of CBDC for India's non-resident Indian (NRI) community are also profound. NRIs frequently face difficulties in remitting money back home and ensuring their families have reliable access to funds. Traditional remittance channels can be slow, expensive, and fraught with uncertainties, especially when dealing with large sums of money. A CBDC could revolutionize this aspect of the financial ecosystem by providing a seamless, secure, and instant method of transferring funds across borders. This would not only reduce the cost and time associated with remittances but also enhance the financial security of families dependent on such transfers.In a country where cash transactions still dominate, a digital currency offers a modern alternative that could gradually reduce the reliance on physical cash, leading to a more transparent, efficient, and traceable financial system. This shift could have significant benefits, including reducing the cost of cash handling, combating counterfeit currency, and improving the government's ability to monitor and regulate the economy.

## INDUSTRY OPINION

### Alekh Johari
**Founder, Anemoi Solution**

The introduction of a CBDC is a positive step towards modernizing India's payment system. It can help combat illegal financial activities and counterfeit currency. Wholesale CBDC has the potential to revolutionize international payments by significantly reducing processing times which currently take several days due to banking processes and holidays. However, widespread adoption of retail CBDC will face challenges. The public is accustomed to using physical cash and has recently adopted UPI. Introducing another digital payment method and changing user behavior will require significant effort for educating the users. Crucial questions remain about how banks will adapt to CBDC, its impact on their operations and finances, and liability in case of transaction failures etc. Building public trust, ensuring robust security measures, establishing a strong regulatory framework and building a strong infrastructure are vital for the successful implementation of a CBDC.

### Arpit Sharma
**COO, PWR Labs**

CBDCs represent a major evolution in money, similar to the historical shift from trading grains to using coins. In India, with its robust payment ecosystem, CBDCs could take digital finance to new heights by improving interbank settlements and making monetary policy transmission faster and more effective. It can also enhance financial inclusion, possibly enabling access to digital payments without the need for a traditional bank account. CBDCs could revolutionize cross-border payments, making them quicker, cheaper, and more transparent—a significant advantage for a country like India with a large diaspora and high remittance flows. Integrating CBDCs into India's financial system presents challenges. The banking sector, which evolves cautiously to maintain stability, will need careful planning to adapt to this change.

User education will also be crucial, as CBDCs introduce a new way of engaging with money. Fintechs and neo-banks are well-positioned to facilitate this transition, helping India advance on its journey toward a fully digitized economy. In summary, while CBDCs offer transformative potential, their successful implementation will require thoughtful integration and collaboration across the financial ecosystem.

### Irfan Khan
**CEO, Hypermine**

As our digital footprints expand, the volume of personal data generated and stored grows, presenting both opportunities and risks. The frequent data breaches and enhanced surveillance capabilities of governments and corporations underscore the need for robust privacy safeguards. CBDCs, while offering benefits like increased financial inclusion and more efficient monetary policy, also raise significant privacy concerns. They could enable real-time tracking of all financial transactions, leading to unprecedented financial surveillance and potential overreach. The concept of programmable money further introduces risks, such as authorities dictating how and when money can be spent, threatening individual financial autonomy.

While digital currencies could bring financial services to underserved populations, this might come at the cost of reduced financial privacy. The vast amounts of economic data provided to central banks raise concerns about data governance and the potential for misuse. To mitigate these risks, privacy technologies like zero-knowledge proofs, homomorphic encryption, and secure multi-party computation are emerging as crucial safeguards. These technologies can help maintain privacy while ensuring the integrity and functionality of financial systems.

As CBDCs become more prevalent, integrating these privacy measures will be essential to balance the benefits of digital currencies with the protection of individual rights and freedoms. The challenge is to design CBDC systems with privacy safeguards from the outset, requiring collaboration between technologists, policymakers, and civil society.

# INDUSTRY OPINION

## Ashish Khandelwal
### CEO, Anq

Digital Rupee represents a significant evolution in India's financial system, offering enhanced security, efficiency, and resilience that UPI alone cannot provide. It could streamline transactions, reduce costs, and improve monetary policy effectiveness. However, its implementation poses challenges, such as potential disruptions to the banking sector, privacy concerns, and cybersecurity risks.

While a CBDC could position India as a global leader in digital finance, a cautious and balanced approach is necessary to mitigate these risks and ensure long-term economic stability.

## Arjun Chand
### Head of Research, LI.FI

CBDCs hold the promise of democratizing finance, bringing it within reach of millions of Indians. But the reality is far more nuanced.

Our country has a vast spectrum of financial literacy, from the bustling metropolises to the remote villages. If not implemented with careful consideration, CBDCs could inadvertently amplify existing economic disparities.

That said, I'm bullish on India's trajectory in the coming decade. The RBI's proactive stance on the e-Rupee is a testament to our country's technological ambition.

By navigating the challenges and harnessing the transformative power of blockchain, we have the opportunity to propel our economy to new heights.

## Harmanpreet Singh Puri
### Founder, Dappquire

Wholesale CBDCs could be a key factor in the success of India’s CBDC initiative. Drawing from Switzerland's experience, where money markets have built a strong financial foundation, wholesale CBDCs could similarly strengthen India’s financial system by modernizing interbank operations and enhancing transaction efficiency.

Retail CBDCs, on the other hand, may have a subtler but valuable impact. Like India’s UPI, retail CBDCs could advance financial inclusion and support the shift to a cashless economy.

UPI revolutionized digital payments by making them accessible, yet its infrastructure largely remains behind the scenes. Retail CBDCs could operate similarly—quietly streamlining everyday transactions and expanding financial access without being immediately visible to the user.

Wholesale CBDCs can also enhance the financial market by enabling short-term borrowing and lending, ensuring that banks maintain necessary liquidity. They support money markets in setting short-term interest rates, which influence borrowing costs, investments, and economic growth. Additionally, wholesale CBDCs can promote financial stability, enabling efficient capital allocation and acting as a safeguard during downturns.

However, with this power comes the responsibility to regulate effectively. Past financial scandals like the Harshad Mehta scam highlight the need for strong oversight. To avoid similar issues, an independent regulatory body—not influenced by political power—must enforce transparency and accountability, ensuring that the CBDC system operates with integrity and supports a stable, fair financial landscape for India.

With careful regulation and responsible oversight, CBDCs have the potential to transform India’s financial ecosystem, paving the way for a more resilient and inclusive economy.

## INDUSTRY OPINION

### Rachit Narang

**Ex: Principal Core Crypto Products, Gemini;**
**Ex: Head of Products, Airtel Payments Bank**

India's strategic pursuit of a Central Bank Digital Currency aligns seamlessly with its broader digital transformation agenda. Building upon the robust foundation laid by the JAM trinity (Jan Dhan, Aadhaar, Mobile), the country's existing digital infrastructure provides a fertile ground for CBDC implementation. The rapid evolution of India's payments landscape, characterized by the widespread adoption of UPI and other digital payment solutions, has created a conducive environment for CBDC adoption. However, the successful implementation of CBDC will require careful consideration of key challenges, such as cybersecurity, data privacy, and consumer trust. A phased approach, coupled with continuous innovation and regulatory oversight, will be crucial in realizing the full potential of CBDC.

To ensure the success of CBDC, India must address several key considerations: interoperability with existing payment systems like UPI, accessibility in rural and remote areas with limited internet connectivity, expansion of financial services to the unbanked and underbanked population, and facilitation of efficient and low-cost international remittances. If executed effectively, India's CBDC initiative can solidify the country's position as a global leader in payments and fintech. By embracing this new technology, India can not only enhance its economic competitiveness but also improve the lives of its citizens.

### Ravikant Agrawal

**Director of Growth, Privado Id**

As CBDCs gain traction, they present a unique opportunity to revolutionize the way AI agents operate within the digital economy.

By equipping AI agents with wallets that support CBDCs, we can enable them to engage in secure, efficient, and instantaneous transactions. This would not only streamline their ability to manage tasks on our behalf but also facilitate complex automated interactions, such as bot-to-bot and bot-to-human payments. With CBDCs, the friction and limitations associated with fiat transactions would be minimized, paving the way for innovative use cases that leverage the full potential of AI in our increasingly digital world.

### Aravind Chandrasekaran

**Founder, BitcoinPe**

India’s rise as a global superpower needs a statement of intent. What better way than to do this by leading the world in CBDC implementation at both the wholesale and retail level. Wholesale efforts will position CBDC-W as the contender for the dominant global currency of the future while retail efforts will result in banking the unbanked and bringing more % of the Indian economy online.

Most dreams die because of financial Insecurity. I am most excited by the power of CBDCs to create financial inclusion for a budding entrepreneur or a poor student needing financial support in remote India. When govt. transfers 30,000 as a stipend to either of these users' CBDC wallets you now know that this money has reached them. This I believe will be the driving force for India to become a global superpower in the coming decade. Indian banks spend a significant amount of money on local and global settlements, imagine the amount of growth capital we can unleash on the economy by making settlements super cheap.

As someone who worked in the cryptocurrency Industry, I am excited by the potential of CBDC to tackle the biggest challenges of the industry - Money Laundering & Terrorism funding using technology. The future of finance is going to be a hybrid of DeFi & CeFi i.e. we will be using the simplicity of DeFi and the benefits of a centralized oversight to conduct businesses more efficiently. I am eager to partner with RBI and other invested authorities to make this vision a reality.

## INDUSTRY OPINION

### Manhar Garegrat
**Country Head (India), Liminal**

When discussing the growth of DPI in India, I think it is extremely important to focus on the contributions of the private sector and open-source technologies that enabled UPI to grow into what it is today. That would not have been the case in the absence of a Jio or PayTM, or GPay (how many use BHIM?) along with a discussion on the contribution of several open-source libraries. My view is that this same private sector development will be required if a CBDC has to truly achieve its objectives. Along these lines, it is important to think of linkages of the CBDC with DeFi protocols with Stable Coins and other similar Blockchain-based rails via NFTs for documents, ownership rights, etc.

### Lakshya Narula
**PhD Economics Candidate, University of Minnesota**

No doubt CBDCs pose various challenges, it shouldn't stop RBI from implementing it, especially the wholesale CBDCs. Given India is a growing economy, wholesale CBDCs can reduce the overall costs of borrowing and lending which will reduce frictions and increase the velocity of money. Instead of paper currency, if India has CBDC, then it will be faster to meet the short-term liquidity requirements, which will enhance the working of its banking industry.

One of the biggest hurdles that India faces in reaching the "middle income" country status is the sheer size of its informal economy. If RBI can conceptualize and implement CBDCs in the right manner, India can turn a major chunk of the informal sector into a formal one. This will also increase the amount of taxes collected and will also improve the amount of data that is being collected in periodical surveys. This improved data can then be used to make better policies that will help India grow faster and better. Since CBDCs are programmable currencies in some manner, anything we imagine about its impact can go south if it is not designed properly. For example, if CBDCs are not designed to cap individual holdings at a maximum, it can give the banking system a run for its money. Effective limits on holdings would prevent wide adoption of CBDCs and, for instance, make digital bank runs into CBDCs impossible. So, even though CBDCs offer a wide variety of benefits, the costs can easily surpass benefits if the CBDC isn't designed properly, especially for the context it is being used.

### Deep Sagar Verma
**Assistant Professor (NIFT)**
**PhD Candidate in Fashion Metaverse**

I see CBDCs as a crucial advancement in global finance. These digital versions of a country's fiat currency, issued and regulated by central banks, offer stability and align with national monetary policies, unlike the often volatile cryptocurrencies. By leveraging blockchain technology, these currencies ensure secure and transparent transactions, while AI enhances efficiency and fraud detection. The global move towards these digital currencies is evident, with countries such as India leading efforts to implement them. India's initiatives aim to modernize its financial infrastructure, drive economic growth, and enhance financial inclusion for underserved populations. In the Fashion Metaverse, integrating these digital innovations can bridge traditional finance with digital transactions, fostering secure and efficient interactions in virtual environments. This advancement not only improves the financial landscape but also supports broader adoption of digital assets and blockchain technology across various sectors.

### Uday Padyana
**Manager, BI & Analytics - Fortune 5 Company**

As the world is moving towards the adoption of cryptocurrencies and centralized digital currencies, it'd be great to see Bharat continue to stay ahead of the curve in the Fintech space by adoption CBDC.

## INDUSTRY OPINION

In the US, we've been seeing the utility of crypto products in public institutions to varying degrees. Recently we saw Avalanche being used to digitize the drivers license across California. We've also digital currency supporting policies in states such as Wyoming. Implementation of CBDC will ensure Bharat's populations participates in the global innovation economy irrespective of location. It opens up trade opportunities to people in mall towns/cities and rural India and just like affordable WiFi, gives them a level playing field in the financial space as well.

### Kamalika Poddar
**Head of Data and Product - Lxme**

What is the real use case for CBDC in India? It’s definitely not in the retail space, where we saw adoption plummet after government-backed cash backs were withdrawn. And after all, why would users want to use it, when we already have a real-time payment system like UPI?

In the B2B space, we’re only now seeing innovating like allowing for utility and bill payments. This is an area where programmatic money can be a huge game-changer. In the retail segment, I would rather advocate for a rupee-backed stable coin, to help with seamless cross-border payments, especially for the growing class of consumers in India who wish to travel abroad.

### Ashank Mittal
**MD, BhooVaanijyak Consultancy Services**

MSMEs have a high chance of becoming multinational companies once they offer their products and services to the global economy with tokens. However, the risks of the ongoing geopolitical crisis coupled with the use of technology put them at high risk if they use privately controlled blockchain protocols influenced by vested interests.

National Blockchain Stack, coupled with Central Bank Digital Currency, provides a reasonably safe space for them to participate. It can even enable MSM REITs, Micro, Small & Medium Real Estate Investment Trusts to be traded with these CBDCs. Thus, CBDCs supported with suitable infrastructure can be a great boon to AatmaNirbhara Bhaarat.

### Pranav Agarwal
**Head of Capital, Foundership Ventures**

CBDCs seem like a logical step in the progression of fiat currency from paper to digital to onchain. However, with the CBDCs that are directly distributed by the central bank (in its direct form), CBDCs present a very deep privacy issue that cannot be ignored for the sake of convenience. The privacy breach is not only with regard to where economic participants are spending or investing their money, but goes to a more fundamental level as the blockchain removes the fungability for the funds.

In a regular bank account, funds are fungible, there is no way to know which money is the one that came from a particular source. The same applies to cash transactions. However, when it comes on to onchain tokens, the same can traced throughout its entire existence. The other issue with CBDCs is that it permits the issuer to bring programmability into the money which may or may not be acceptable to the receiver. Today, money is equal & doesnt come with strings attached. With CBDCs, the same may be possible.

The only way a CBDC adds value is by reducing the counterparty risk of the banking system. However, that too is inevitable as most economic participants want to borrow, lend, save, invest, transfer funds to others. All of this cannot be routed through a central bank, and would be immature for any economy. Hence, CBDCs would still require the banking industry to service the money related needs of the people.

# LEARNINGS FROM EXPERT OPINIONS

**1. Foundation and Potential for Financial Inclusion**
India's existing digital infrastructure, including the JAM trinity and UPI, provides a strong foundation for CBDC implementation. Many experts view CBDCs as a powerful tool for enhancing financial inclusion, potentially bringing millions of unbanked and underbanked Indians into the formal financial system. This could democratize access to financial services, especially in rural and remote areas.

**2. Wholesale vs. Retail CBDCs**
There's a clear distinction in expert opinions regarding wholesale and retail CBDCs:

- Wholesale CBDCs are seen as having more immediate and transformative potential. They could significantly improve interbank settlements, enhance monetary policy transmission, and revolutionize cross-border payments.
- Retail CBDCs, while offering benefits, are perceived as facing more significant adoption challenges due to the public's familiarity with cash and recent adoption of UPI.

**3. Privacy and Security Concerns**
A major recurring theme is the tension between the benefits of CBDCs and privacy concerns:

- CBDCs enable real-time tracking of financial transactions, raising concerns about surveillance and individual privacy.
- Experts stress the critical role of privacy-enhancing technologies like zero-knowledge proofs and homomorphic encryption in addressing these concerns.
- Striking the right balance between transparency and privacy is seen as crucial for public acceptance and ethical implementation.

**4. Economic Implications**
Experts highlight several potential economic impacts of CBDCs:

- Reduced costs for borrowing and lending
- Increased velocity of money
- Potential formalization of a significant portion of India's informal economy
- Improved tax collection and economic data for more effective policymaking

**5. Challenges and Risks**
Several challenges and risks were identified:

- Potential disruption to the traditional banking sector
- Need for extensive public education and awareness
- Cybersecurity risks and the need for robust infrastructure
- Concerns about programmable money and potential for financial control

**6. Global Context and Opportunities**
Experts view CBDCs as an opportunity for India to:

- Lead in the global financial system
- Improve cross-border transactions and remittances
- Potentially offer an alternative to dollar dominance in international trade
- Foster economic cooperation within BRICS and G20 nations
- Enhance India's digital diplomacy and tech exports

**7. Integration with Emerging Technologies**
Many opinions highlight the potential synergies between CBDCs and other emerging technologies:

- Blockchain and distributed ledger technologies for enhanced security and transparency
- AI for improved efficiency and fraud detection
- Integration with the broader Web3 ecosystem
- Smart contracts for programmable money and automated financial operations
- Integration with Digital Public Infrastructure (DPI) to create a comprehensive digital economy

**8. Regulatory and Governance Considerations**
Experts emphasize the need for:

- A robust regulatory framework
- Clear governance structures
- Balancing oversight with innovation to prevent stifling growth
- Addressing concerns about money laundering and illicit activities
- Developing international standards for CBDC interoperability

**9. Phased Implementation and Experimentation**
Several opinions suggest a cautious, phased approach to CBDC implementation:

- Starting with wholesale CBDCs before moving to retail
- Conducting thorough pilots and experiments
- Learning from global experiences and best practices

**10. Balancing Innovation and Stability**
A key theme is the need to balance innovation with financial stability:

- Leveraging CBDCs for modernization while maintaining the stability of the financial system
- Ensuring CBDCs complement rather than disrupt existing successful systems like UPI
- Mitigating potential risks to the traditional banking sector
- Addressing concerns about digital bank runs and impact on monetary policy
- Exploring the role of CBDCs in enhancing overall financial system resilience
- Considering the implications for credit creation and the broader economy

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