

whitepaper

Central Bank Digital Currency: The Future of Money

ALSO: Why banks should adopt platform-based approach to accelerate the CBDC revolution



Taking Banks to the
future, faster. Together.

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Preface

As a central bank, retail or corporate bank or other depository financial institution, here are a few numbers to consider with respect to adoption of Central Bank Digital Currency (CBDC).

100

The number of countries where retail CBDC is being explored

90%

Percentage of central banks exploring CBDC with 50% running concrete experiments

67%

Percentage of central banks likely to issue retail CBDC within next 5 years

Today, as we enter the endemic era, Central Bank Digital Currency (CBDC) has risen from obscurity to the forefront of the global economic policy discussion. The CBDC debate has moved on to its implementation and implications for the financial system, notably the impact on international payments. Every month, we see a consortia of central banks releasing CBDC transaction capabilities developed for Corporate Banking use cases, the most recent being Bank for International Settlements and Monetary Authority of Singapore. Additionally, the emergence of digital currency has created newer avenues to leverage the potential of distributed networks. The primary benefit of digital currencies is their simplicity of usage. Considering digital money focuses on user privacy, data breaches are unlikely – since it includes minimal personal information. Digital currency also has the potential to increase commerce with faster cross-border settlements, while easier transaction provenance between counterparties and stakeholders will drive newer models.

LTIMindtree: A frontrunner in the CBDC revolution

LTIMindtree has been heavily involved in CBDC and offers a unique viewpoint on its development and implementation.

We are incubating a Blockchain-based CBDC solution aimed at central banks, commercial banks, and financial market infrastructure providers. The platform showcases a working model to drive wholesale and retail networks - as well as interoperability between CBDCs and other physical currency platforms.

LTIMindtree is currently in talks with global banks across US, Europe, Africa, a central bank in Africa, and a global payments & cards leader to implement CBDC platform for retail & wholesale banking, payment interfaces and cross-border payments.

The aim of this paper is to bring-forth industry and domain points of view of CBDC and shed light on how introducing it will impact financial institutions and policy makers in terms of improving monetary accessibility to the financially challenged as well as organizations that demand edge settlements services to drive new-age business models. The paper analyses the evolving nature of CBDC's wholesale and retail applications. Last but not the least, it elaborates on the rising demand for CBDC platform solutions and the crucial role played by solution integrators in fulfilling this need.

Evolution of Money: An Introduction

Throughout the course of human history, currency has served as a means of recording transactions, preserving value, and monitoring economic activity. **The barter system** is considered the earliest form of currency as it entailed the direct exchange of goods and services between individuals without the need for standardized currency.

The emergence of **commodity currencies** can be attributed to the increasing complexity of economies. Various commodities such as cowrie shells, salt, and livestock were utilized to attain the desired outcome. Gold and silver were historically recognised as currency due to their stability, portability, and scarcity.

The implementation of banknotes as a form of paper currency supported by gold reserves has enabled seamless value transfer and storage. Central banks were established to introduce **fiat money**, which is not commodity-backed, but rather government-supported, to enhance the management of cash supply and boost economies.

The emergence of novel technologies and shifting social norms will invariably give rise to diverse forms of currency that cater to the demands of the populace. The ongoing study of the progression of monetary systems, from barter to electronic transactions, is quite intriguing. The adoption of coins and paper money as a medium of exchange marked a significant milestone in the evolution of monetary systems.

The adoption of **credit and debit cards** in the late twentieth century obviated the necessity of physically conveying large amounts of currency. Prior to the advent of ATMs and online banking, payment methods had already undergone significant simplification. The implementation of **electronic fund and wire transfers** has enabled the seamless transfer of money across international borders.

The integration of **mobile banking** and electronic wallets has brought about a significant transformation in the financial services sector. Our customers can conveniently utilise their mobile devices to initiate transactions, transfer funds to acquaintances, and settle their utility bills.

The drive for convenience, security, and speed has been the impetus behind the ongoing evolution and progress of payment technology.

Evolution of money & its form as Exchange Medium

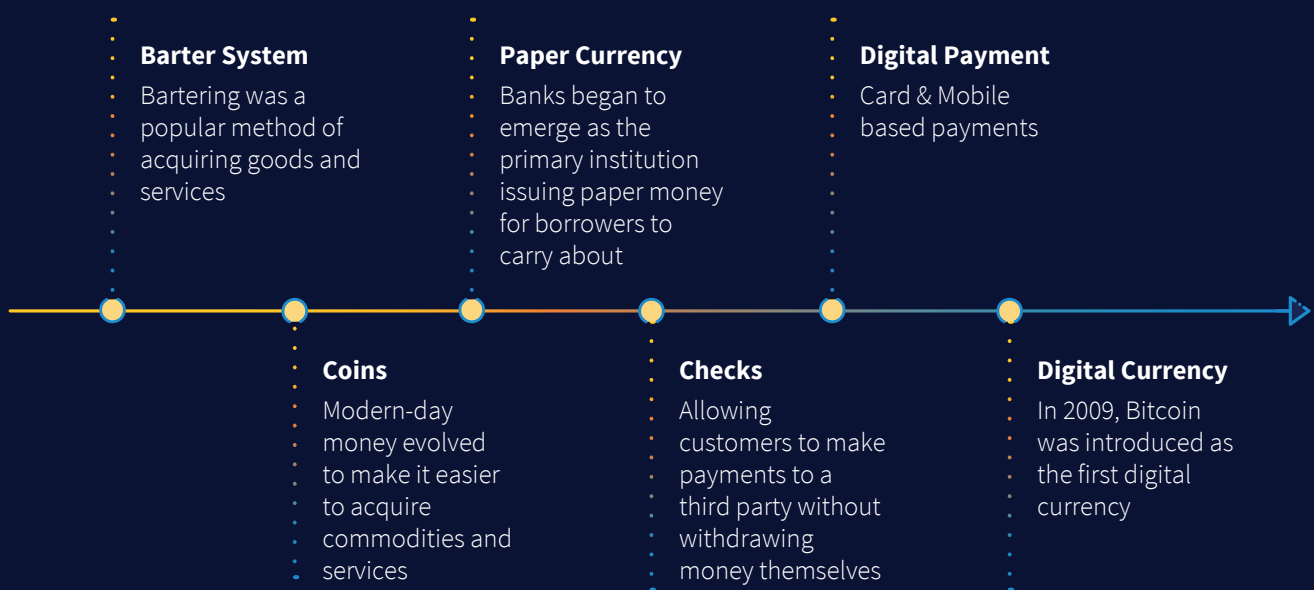


Fig. 1 Journey of Money

Digital Currency: Benefits and Challenges

The utilization of digital payment mechanisms has become ubiquitous. The surge in popularity of digital payment systems for all types of purchases has been observed in the aftermath of the pandemic, while the shopping experience has been transformed by new technologies. The implementation of digital payment processing has resulted in improved efficiency, security, and convenience for monetary transactions.

Counterfeit

Due to advancements in digital technology counterfeiting physical currency has become easier

Post Pandemic Trend

Online transactions are driving digital exchange of value thus reducing the use of printed currency

EOD Settlements

The dawn of digital payments have put pressures on banking ecosystems to execute a greater number of settlements

Cross Border Value Exchange

Due to digital push more and more economies are opening markets and require faster settlement cycles to allow cross border payments as compared to physical currencies

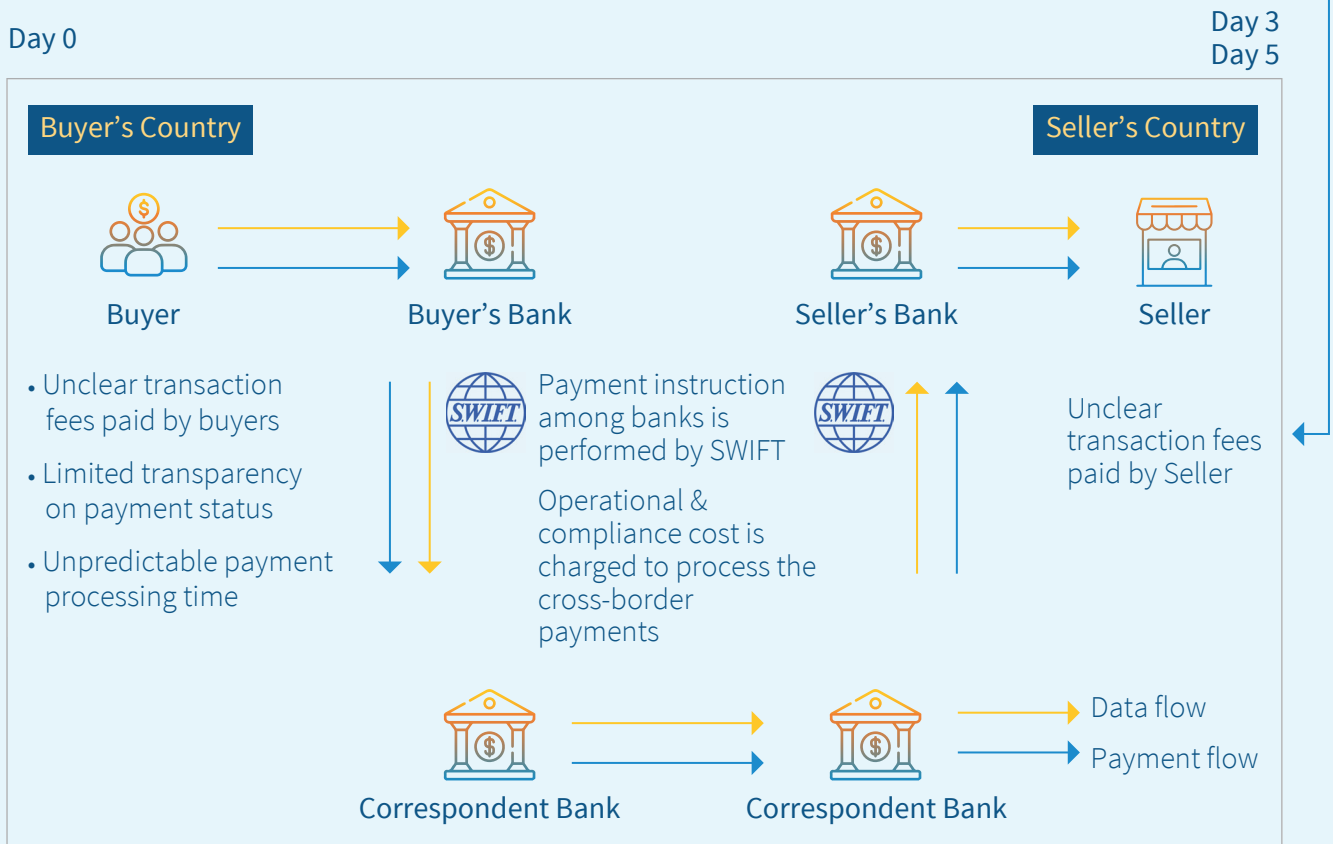
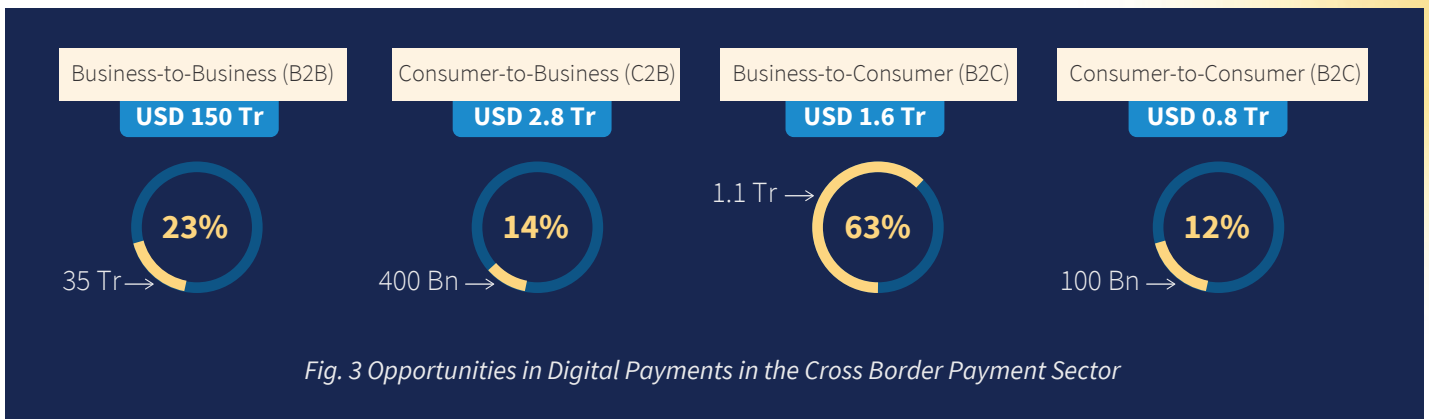


Fig. 2 Challenges with Fiat Currencies

The prevalence of digital transactions for **foreign remittances** has risen in recent times. Digital payment options such as online banking and mobile payment apps are widely utilised for international money transfers.

The increasing popularity of digital payment methods can be **attributed to their convenience**. Traditional payment methods such as wire transfers can prove to be both costly and time intensive. Performing a digital transaction is a straightforward and expedient process, irrespective of the location. The convenience of digital payments has resulted in a widespread preference for them among consumers.



We anticipate a global increase in the utilisation of **digital channels for international remittances in the upcoming years**. As we continue to witness the widespread adoption of digital payments, it is anticipated that traditional payment methods will gradually become less popular due to the convenience, enhanced security, and cost-effectiveness that digital payments offer. In North America, the digital payments market was estimated to be around USD 87.07 billion in 2021 and is expected to cross **USD 204 billion by 2028**. (Refer 2, 3 in references)

One must also take into consideration that digitization at various levels in the payment ecosystem and the collective efforts of the global community have brought the global average cost of international remittances from over 10 percent to 6.82 percent in the last decade.

In the realm of digital currency, the term ‘private’ denotes the absence of issuance or backing by a governing authority. Digital currencies are transacted and secured through cryptographic algorithms on decentralized networks. **Decentralized digital currencies** such as Bitcoin, Ethereum, and Litecoin are prevalent in the market. While these currencies offer the convenience of P2P transactions, online shopping, and international money transfers, it's important to note that they **operate outside the regulatory framework of fiat currencies**. There are several challenges associated with digital payments and private digital currencies, including:

- The lack of proper supervision is a cause for alarm regarding the likelihood of market manipulation, money laundering, and terrorism financing with respect to private digital currencies.
- The vulnerability of digital payment systems to hacking, cyber-attacks, and fraud can lead to significant financial losses and the compromise of sensitive personal information.
- The volatility of private digital currencies renders them unsuitable as a reliable store of value or investment option.

It should be noted that the **accessibility of digital currencies is not universal**, as the requisite technology and infrastructure may not be available to all. Despite the growing popularity of digital payments, this remains a significant barrier for some individuals.

Risks associated with Digital Currency

Unwarranted Transparency

In many respects, transparency is damaging and even dangerous. Each transaction can show the counter party your wallet balance. Large corporations can follow your wallet transactions with no effort.

Uncontrolled Price Volatility

Limited market capitalization and less than 1% of addresses can own more than 90% of all issued currencies making large investors to have a significant effect on its price. Investor sentiment may swing widely, especially in the aftermath of high-profile cybersecurity incidents. E.g., Bitcoin has fluctuated from less than USD4,000 to more than USD19,000.

Non-regulated and shaky enthusiasm

Value of digital currency is primarily determined by trust. Unregulated digital currencies get value from the number and excitement of their active user group. The entrance of a superior alternative, the introduction of a new technical paradigm, anxieties fueled by a high-profile cybersecurity attack, or just a loss of interest might all disrupt trust in a digital currency.

Threat to national monetary sovereignty

Poses significant hazards to monetary policy. Because they are not backed by a governmental entity, they have no legal value. Central banks can potentially essentially lose control over monetary circumstances. Central Banks may lose the position as lender of last resort in the event of bank liquidity failure.

Although digital payments offer convenience, we must consider the **potential privacy implications** due to the collection and sharing of personal information. Also, interoperability issues between various private digital currencies can hinder cross-currency or cross-platform transactions, leading to inefficiencies.

While private digital currencies and digital payments do offer potential benefits, it's important to address the significant challenges that must be overcome before they can achieve widespread adoption.

The rise of CBDCs

CBDC is digital money that is **issued and backed by a country's central bank**. It is increasingly being considered as a viable alternative to physical currency, with the potential to enhance financial inclusion and optimize payment systems.

During the early 2000s, central banks globally initiated the process of generating digital replicas of their national currencies, thereby commencing the era of CBDCs in their present form. CBDCs gained significant traction only with the **emergence of cryptocurrencies and blockchain technologies**. (Refer 3, 4, 5 in references)

In 2014, the Central Bank of Ecuador successfully issued the first national digital currency, Dinero Electrónico. It's worth noting that various national banks, including China, Sweden, and the Bahamas, have either launched their own CBDCs or are currently in the process of doing so.

The COVID-19 pandemic accelerated the development of CBDCs as governments and central banks globally sought to address the economic hurdles posed by the outbreak.

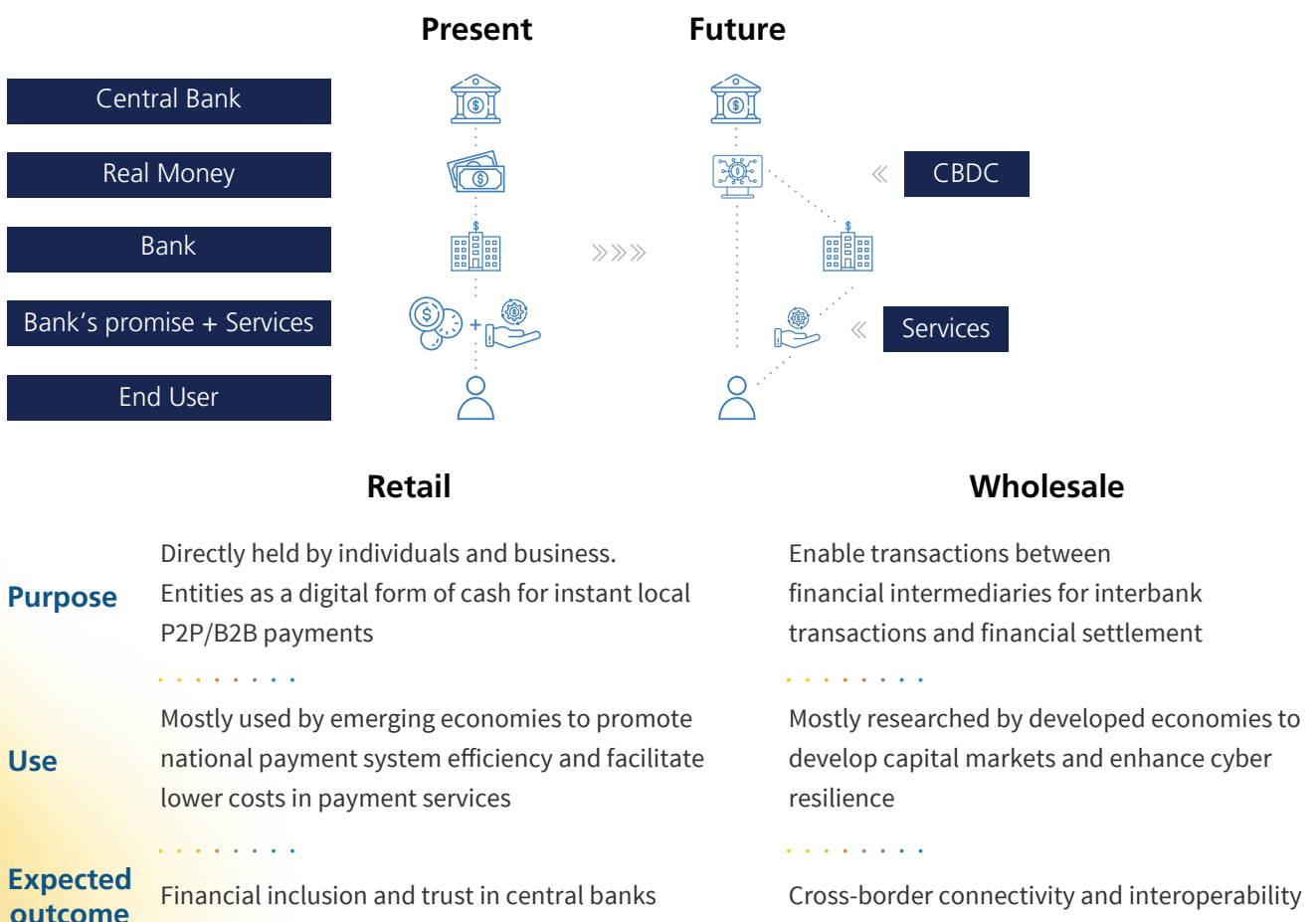


Fig. 4 Global CBDC Evolution Landscape

It is important to note that CBDC has the potential to become the primary means of exchanging and storing wealth, potentially replacing traditional paper money. The current landscape of digital payment methods and the surge of cryptocurrencies have led to an increased demand for CBDC platform solutions.

The necessity for CBDC platform solutions is gaining traction as the world continues to shift towards a digital landscape. While the pandemic accelerated the adoption of digital payment methods – replacing the traditional and less efficient cash system – the increasing popularity of electronic payment methods can be attributed to the widespread apprehension of carrying cash. **The potential implementation of a digital currency is being evaluated by central banks worldwide to stay current with the evolving landscape.**

The potential implementation of CBDC could optimize the financial system and enhance its **inclusivity**, thus facilitating cross-border payments, reduced transaction costs, and shortened settlement times. It presents an opportunity to enhance the **accessibility** of banking and financial services to untapped demographics. Additionally, CBDC can be developed for either institutional purposes within the banking sector or for individual usage by the general public. (Refer 3, 4, 5, 6 in references)



Wholesale CBDC

Banks, payment processors, and other members of the financial sector are the target users of wholesale CBDC. Efficiency gains, lower settlement risk, and greater openness in monetary dealings are just a few of the advantages wholesale CBDC can provide. There are two major applications for wholesale CBDC, and they are interbank settlements and securities settlements. *(Refer 14 in references)*

Interbank Settlements

Wholesale CBDC-based interbank settlements have the potential to provide several advantages over traditional methods. The implementation of wholesale CBDC facilitates **instantaneous interbank settlements** by eliminating intermediaries and reducing settlement risk. It holds promising prospects for augmenting transparency, reducing the aggregate expenses, and optimizing the efficacy of cross-border fund transfers.

Securities Settlements

Wholesale CBDC can be utilized for securities settlements as well. Implementing wholesale CBDC enables **instantaneous settlement of securities transactions**, eliminating intermediaries and reducing settlement risk. Implementing this solution would be highly advantageous for financial institutions as it can reduce the duration and expenses associated with securities settlements.

Retail CBDC

The purpose of retail CBDC is to serve as a medium of exchange and storage for the general population. Improved financial inclusion, lower transaction costs, and greater efficiency are just a few of the numerous potential advantages of retail CBDC. Payments made by consumers and governments are two common retail CBDC applications. *(Refer 12, 13 in references)*

Cash Transfers

The public can utilize retail CBDC as a payment method, which has various advantages over more conventional methods of making purchases. Retail CBDC allows for instant settlement of transactions, which cuts down on fees and boosts productivity. In addition, CBDC sold at retail can help the unbanked by giving them another payment option.

Government Benefits

Government payments are another potential application of CBDC in retail. Payments from the government, such as social welfare checks and tax refunds, can be disbursed more quickly and safely through retail CBDC. Retail CBDC can also reduce costs associated with printing and distributing physical currency.

Other Use Cases of CBDC

Cross-border Payments

Digital payments take a major share in digital transactions worldwide and majority of these payments are of cross border transactions between parties be it Business to Business (B2B), Customer to Business (C2B) or Customer to Customer (C2C) types. Although cross border payments via known channels like SWIFT have fixed settlement timelines and costs but remittances which are initiated via wire transfer have undefined timelines and costs involved due to undefined number of intermediaries involved to complete the settlement resulting in frictions. Through CBDC, there are **major efficiency improvements awaiting remittances and cross-border payments**. CBDC can help bring transparency in overseas payments by driving real-time settlements across regions and currencies. This will also help in reducing settlement friction with respect to conversion rates. *(Refer 7 in references)*

Regulatory Auditing

Anti-Money-Laundering and Know-Your-Customer compliance has been a key regulatory requirement forcing several financial institutions to create siloed solutions that may have region-centric adaptations within a bank. This exponentially increases the complexities involved in auditing large financial institutions with a global footprint. CBDCs can help by providing a **transparent and traceable digital payment system**, which can reduce the risk of money laundering and terrorist financing, thus helping improve the accuracy and efficiency of regulatory reporting requirements. This can also help reduce audit risks as CBDC-based payment systems allow regulators and financial institutions to seamlessly share data across boundaries.

Taking a Platform-Based Approach to CBDC

Solution integrators should prioritise CBDC platform solutions that help overcome the following challenges while tapping into opportunities. *(Refer 7,8 in references)*

Challenges

Several DLT platform stacks available but little interoperability between platforms

Choosing the underlying platform to keep technical debt under check

Existing digital wallets cannot interoperate with physical currency systems

Robust design approach to solve for industry *(Refer 10, 11, 12 in references)*

Opportunities

To support interoperability between Digital Currencies and platforms

To make digital currencies working seamlessly with existing payment rails and regulations

To support seamless interchange between digital and fiat currency

Faster Cross Border payments and settlements

Better visibility and transparency for Central Bank and Regulators

Access to CBDC platform solutions is crucial for digital financial transaction integrators. The incorporation of CBDC into existing monetary infrastructures can enhance interoperability. The consolidation of solution integrators on a **common CBDC platform** can result in reduced development costs for digital payment systems.

CBDC platform solutions will present an opportunity for solution integrators to broaden their service offerings and reap the benefits. The implementation of CBDC can facilitate the automation of monetary commitments through smart contracts. It has the potential to optimize

the **efficiency of the monetary system and reduce the costs** associated with executing financial agreements. The utilization of CBDC enables the implementation of programmable money, which facilitates the automation of payments based on various factors such as time and location.

CBDC platform solutions offer enhanced security for online transactions. The central bank's backing of CBDC enhances its **resilience against counterfeiting**. These solutions offer enhanced security for online transactions, which is a significant advantage. To ensure maximum privacy protection for users, it is possible to programme CBDC to disclose only essential data required for a transaction.

LTIMindtree's Trusted Digital Currency Platform

LTIMindtree's **Trusted Digital Currency Platform** aims to seize the opportunity presented by the financial revolution by utilizing DLT, which can also be used to organize and control a consortium, thus ensuring interoperability. This **one-stop platform** offers diverse features, from minting money to auditing for the wholesale domain and aspects like distribution to wallet transfers for the retail domain. The platform offers several benefits, such as **interoperability** between digital currencies, rest API-based transaction update services that can be integrated with the instant payment systems, and the interchange between digital and fiat currency. It also provides **real-time liquidity information** and allows end users to print CBDCs in real-time for easy and instant usage across central and private banks, customers, and regulators.



Supports interoperability between Digital Currencies and platforms



Provides digital currencies to be working seamlessly with existing payment rails and regulations



Helps in seamless interchange between digital and fiat currency



Enables faster Cross Border payments and settlements using CBDC



Gives better visibility and transparency for Central Bank and Regulators

Fig. 6 Benefits of LTIMindtree's Trusted Digital Currency Platform

Our approach to address Cross-Border Funds Transfer Challenges

In 2018, the esteemed Committee on Payments and Market Infrastructures (CPMI) conducted a thorough assessment, identifying key areas for enhancing the existing infrastructure of cross-border payment systems. Cross-border transfers, without a doubt, pose a multitude of risks, complexities, and regulatory requirements that far exceed those associated with domestic payments. Nevertheless, it is not unusual for the extent of this discrepancy to be perceived as quite significant.

Since then, numerous banking and financial institutions have demonstrated remarkable progress in diligently addressing the prevailing gaps. However, it is imperative to acknowledge that numerous cross-border payment systems persistently face comparable challenges such as escalated costs, suboptimal efficiency, and security concerns arising from non-transparent processes.

The Trusted Digital Currency Platform possesses immense potential in effectively mitigating friction within cross-border payment processes. Given the round-the-clock operational nature of Central Bank Digital Currency (CBDC) transactions, any concerns regarding shortened settlement timeframes resulting from disparities in time zones can be promptly addressed. By strategically incorporating flexibility for seamless interoperability in the early stages of our design process, we can proactively mitigate any potential challenges that may arise from interfacing with disparate data formats and outdated technology platforms. We have seamlessly integrated state-of-the-art liquidity management provisions and foreign exchange dealing capabilities directly into our platform. By implementing a cutting-edge system that facilitates FX transactions directly on our platform, in a seamless wallet-to-wallet fashion, we will strategically eradicate the necessity for a cumbersome network of intermediaries. Our revolutionary platform, with its impeccable wallet functionality, facilitates flawless interoperability between Central Bank Digital Currencies (CBDCs) and Fiat currencies. Moreover, it empowers CBDCs to transcend geographical boundaries and interoperate on a global scale.

Conclusion

The potential of CBDC to transform monetary transactions and value storage is significant. The current landscape of digital payment methods and the increasing popularity of cryptocurrencies have led to a significant demand for CBDC platform solutions. Access to these solutions is crucial for digital financial transaction integrators. The implementation of CBDC can yield numerous benefits such as enhanced interoperability, reduced costs, and the provision of value-added services.

About LTIMindtree Banking & Financial Services

We enable banks, card and payments networks, and capital markets institutions to accelerate digital transformation, reimagine their business and technology models, and take them to the future, faster. LTIMindtree's strong domain and technology capabilities, focused sub-industry offerings, and a strong partner ecosystem, enable true end-to-end transformation, helping BFS customers modernize their core, reimagine their go-to-market models, achieve their sustainability goals, adopt cloud, monetize data and insights, and better engage with their customers through insightful analytics, personalized marketing, and tailored experiences.



Authors' Profiles



Pradeep K Mishra

CTO, BFS

Pradeep K Mishra heads the technology function for LTIMindtree's BFS domain and has diverse experience in this space and related clientele. He has been spearheading several key initiatives within LTIMindtree, including quantum computing and CBDC.



Sushant Mayekar

Chief Architect, BFS

Sushant Mayekar brings deep expertise in Distributed Ledger Technology, and has been pivotal in terms of driving several key engagements in the BFS domain for several top clients of LTIMindtree.

Kindly contact info@ltimindtree.com for additional details and to view a live demonstration.

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About LTIMindtree

LTIMindtree is a global technology consulting and digital solutions company that enables enterprises across industries to reimagine business models, accelerate innovation, and maximize growth by harnessing digital technologies. As a digital transformation partner to more than 700 clients, LTIMindtree brings extensive domain and technology expertise to help drive superior competitive differentiation, customer experiences, and business outcomes in a converging world. Powered by 82,000+ talented and entrepreneurial professionals across more than 30 countries, LTIMindtree — a Larsen & Toubro Group company — combines the industry-acclaimed strengths of erstwhile Larsen and Toubro Infotech and Mindtree in solving the most complex business challenges and delivering transformation at scale. For more information, please visit <https://www.ltimindtree.com/>